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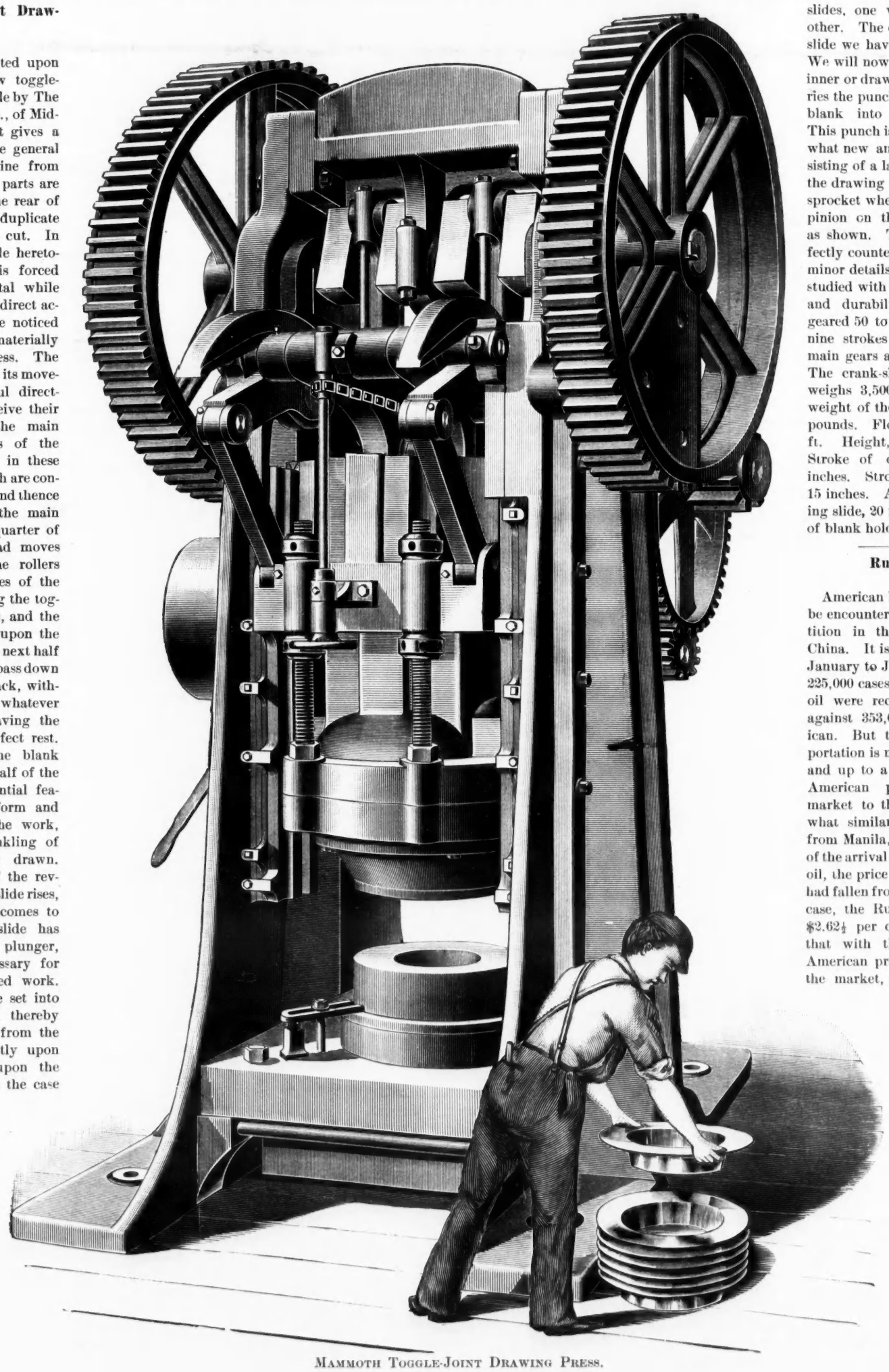
Mammoth Toggle-Joint Drawing Press.

The illustration presented upon this page represents a new toggle-action drawing press, made by The Stiles and Parker Press Co., of Middletown, Conn. The cut gives a fair representation of the general appearance of the machine from the front. The working parts are symmetrical in design, the rear of the machine being but a duplicate of the view shown in the cut. In all drawing presses made heretofore the blank holder is forced down, and holds the metal while it is being drawn, by the direct action of cams. It will be noticed that this press differs materially from the so-called cam press. The blank holder slide receives its movement from four powerful direct-acting toggles, which receive their motion directly from the main shaft. The upper links of the toggles are slotted, and in these slots are steel rollers which are connected with a crosshead, and thence through the pitmans to the main shaft. During the first quarter of a revolution the crosshead moves down so as to bring the rollers upon the straight surfaces of the upper links, thus bringing the toggle links to a straight line, and the blank holder slide down upon the work to be held. For the next half of a revolution the rollers pass down the plain surfaces and back, without exerting any power whatever upon the links, thus leaving the blank holder slide at perfect rest. This perfect rest of the blank holder slide during this half of the revolution is a most essential feature, as it gives a uniform and constant pressure upon the work, which prevents any wrinkling of the blank while being drawn. During the last quarter of the revolution the blank holder slide rises, so that when the press comes to rest, the blank holder slide has overtaken the drawing plunger, giving all the room necessary for the removal of the finished work. The toggle trunnions are set into the frame of the press, thereby throwing all the strain from the blank holder slide directly upon the frame, instead of upon the main shaft bearings, as is the case in the cam press. The adjustment of the blank holder is obtained by four large screws passing through long bearings in the upper end of the slide and held in place by check nuts having broad faces, which, combined with the long bearings, gives a rigidity to the slide otherwise unattainable. It will be noticed by referring to the engraving that there are two slides, one working within the other. The outer or blank holder slide we have already described. We will now call attention to the inner or drawing slide which carries the punch which presses the blank into its desired shape. This punch is adjusted by a somewhat new and novel device, consisting of a large screw and nut in the drawing slide. This nut is a sprocket wheel and is driven by a pinion on the hand wheel shaft as shown. The machine is perfectly counterbalanced and all the minor details have been carefully studied with reference to strength and durability. The press is geared 50 to 1, giving the slides nine strokes per minute. The main gears are 86″ in diameter. The crank-shaft is of steel and weighs 3,500 pounds, the total weight of the press being 85,000 pounds. Floor space, 8 ft. by 9 ft. Height, 16 ft. 6 inches. Stroke of drawing punch, 20 inches. Stroke of blank holder, 15 inches. Adjustment of drawing slide, 20 inches. Adjustment of blank holder slide, 14 inches.



MAMMOTH TOGGLE-JOINT DRAWING PRESS.

Russian Oil.

American kerosene oil seems to be encountering decided competition in the East Indies and China. It is reported that, from January to July of the past year, 225,000 cases of Russian kerosene oil were received at Shanghai, against 353,000 cases of American. But then the Russian exportation is not yet two years old, and up to a short time ago the American producers had the market to themselves. A somewhat similar report is received from Manila, and, in consequence of the arrival of cargoes of Russian oil, the price of the American oil had fallen from $3.25 to $2.75 per case, the Russian oil selling at $2.62½ per case. It is thought that with this difference the American producers can control the market, for the reason that the Russian oil is an inferior article, as it is dull and smoky, and emits a disagreeable odor, unless the lamp is kept clean and in perfect order. There is practically no limit to the supply of Russian oil; it is found in such large quantities that no use can be made of it. The oil from many flowing wells has been pouring into rivers for many years.

A New Drawing Table.

The drawing table of which we give an illustration has lately been brought out by Messrs. Jones & Mack, 5 West Fourth street, Cincinnati, O. The principal features of this table are, that the drawing board may be raised or lowered with one motion of the hand; and the board can be tilted to any desirable angle. The vertical sliding pieces attached to the underside of the board have racks engaging with wheels on the ends of the horizontal shaft, shown at the bottom of the sliding frame. A spiral spring is wound around this shaft for the purpose of balancing the weight of the parts to be raised, and insuring the board against falling if left at any elevation without clamping. The board is raised or lowered by means of the lever attached to the sliding frame, and working on a fulcrum fastened to the stand. The clamping arrangement is novel. It consists of a bent tube, its ends bearing against the inner sides of the sliding pieces. A bolt is passed through this tube, and, in clamping, it tends to straighten the tube, thereby forcing the ends of the tube against the inner faces of the sliding pieces, and holding these pieces firmly at any height. The advantage of this clamping device is, that it does not tend to draw the stands together. The arrangement for tilting is easily seen, and the device for clamping is the same as the one just described.

While the stand is very light, it is at the same time extremely rigid and firm, and, with the clamping screws tightened, there is no liability to slip, even if the draftsman rests his entire weight on the edge of the board. These stands are furnished with or without drawing boards, or will be furnished with hard wood top for office or library use, for which the stand is well adapted, from the fact that it may be arranged to suit circumstances. Messrs. Jones & Mack have named it the I X L Drawing Table.

NEW DRAWING TABLE.

Pattern Making.

BY P. S. DINGEY.

FIRST PAPER.—SHEAVES.

When sheaves are over nine feet in diameter, it is better to form them with cores instead of making a pattern, because patterns of larger sizes generally go out of round and are very inconvenient for storing. I propose to give under this head some ideas for making sheaves of various kinds, and will first give a way to make the large ones from core boxes.

The style of sheaves shown here is that which is used to transmit power on cable car roads. The groove is made to receive segments that are bolted on, and of which more will be said further on. The right-hand side of Fig. 1 shows one arm and a portion of the rim; as will be seen, this sheave is in halves, and arranged for bolting together, so that stock for facing should be allowed at *E*. In Fig. 2, two sections are shown; that on the right is a view through the arm core *A B*, and that on the left through *C D*, Fig. 1. These two sections represent the mould being closed, but in Fig. 1 I have shown the mould open, with the arm cores *F* and *G* set. Notice that the lower part of rim is made in green sand, a segment pattern being used in ramming it up. This segment pattern is shown to the left in Fig. 1, *H* being a section of it. Two battens, *a b*, are screwed on, which run to the center; the ends are cut to fit around the spindle.

The lugs at the joint for bolting the rim together must be right and left hand on the segment pattern, using one when starting to form the bottom, and the other when finishing. These lugs are screwed on temporarily. Care must be taken to divide the arms off accurately on a level bed. After marking the center line on the bed for each arm, move the segment around on the spindle and apply the center line of the core print for the arm core to the center lines on the bed. Now, as lines on sand soon disappear, it will be well to drive a small stake on each side of the print for arm core, so that, when moving the segment to each division, the arm print can set down between the stakes, and thus insure accuracy. It is particularly necessary to divide these arms off equally, so that the bolt-holes shall match those in the segments that go in the groove, for it is the intention that all the holes, both for bolting together the sheave and segments, are to be cast in. But to compensate for any difference that may occur, the holes are made a little long in the rim and lugs, as seen at *J*, Fig. 1.

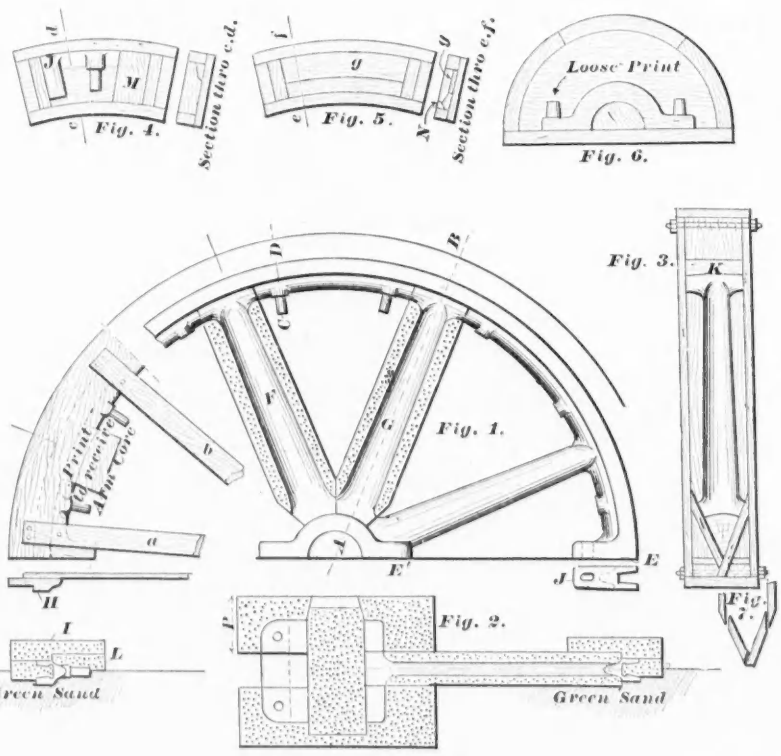
Fig. 3 is the arm core box, and should be made strong, as it generally gets a lot of hard knocks, and unless it is made strong it will come apart, as I have seen them often, and then there is trouble about the cores not coming together at the center as they should do.

Fig. 7 shows the way some pattern makers construct these large arm core boxes; the result is, they are rammed apart as shown, and then the poor moulder or core maker is accused of using the core box roughly. In making this box it should be made a little longer than is necessary for the present job, so that the end *K* can be moved out and the arm lengthened for a larger wheel whenever it may be needed. The pieces that form the hub must be made interchangeable.

Fig. 4 is the core box for forming the cope left in for the bottom part of core and taken out for the cope part. The groove that this core is to form is turned on the two sides, but not in the bottom; tool clearance is allowed at each side in the bottom to accommodate the turning. This is seen in the section at *N* in Fig. 5.

I have not shown any core box for the slab core *I*, in Fig. 2, as it is nothing but a plain core, and the box is simple and needs no explanation as to making it.

Fig. 6 is the core box for the hub. It is made the depth of *P* in Fig. 2. This view gives all the explanation that is necessary as to the way to make it. The faces of the hub and lugs are closed with slab cores.



PATTERN MAKING.

side of rim (see core *L* in Fig. 2). The same lugs, *J*, that were used on the segment pattern can be used in this box for two cores, using one right hand and one left. The box is shown arranged for the first core on the left. *M* is a loose piece half the width of the core print that receives the arm core. It will be seen that this box in Fig. 4 is made longer than the core is needed. The reason for this is to enable us to change ends with the loose piece *M*, when making a core the opposite hand. The length of this box is from the center of the arm to the joint *E*, and as there is $\frac{1}{4}$" stock allowed for facing the joint, this would make the box $\frac{1}{4}$" longer than the eighth part of the half sheave, and therefore $\frac{1}{4}$" too long for the other cores, so that a $\frac{1}{4}$" piece must be put in the end of the box after making two cores with the lug *J*.

Fig. 5 is the box for the groove cores. The section of this box shows that I have arranged it to make each core in two parts, to be pasted together at *o o*, Fig. 2. The cope part of this core is a little different from the bottom part, so that a loose piece *g*, in Fig. 5, is fitted in the bottom of box, to be

Early Engineering Reminiscences.

BY GEORGE ESCOL SELLERS.

FORTIETH PAPER.

Up to Jan. 5, 1853, no settlement or agreement was made with Messrs. Shawk & Latta for the cost of constructing the engine, but on that date the council passed a resolution authorizing the city fire engineer to purchase four sound horses, not to exceed $400 in cost, for the purpose of the steam fire engine. At the same meeting of council, a resolution passed to construct a temporary building for the accommodation of the steam fire engine, at a cost not to exceed $275. At this meeting, the account of *Shawk & Latta* for building the steam fire engine was again presented, and was again referred back to the special committee.

On Jan. 17th, 1853, the committee reported recommending the payment of five thousand dollars, balance in full of the ten thousand for the steam fire engine. This was decided in the negative. Then a motion was made that the mayor issue his proclamation for an election within ten days, of "yea or nay" on the payment of the steam fire engine; this was amended, providing another trial throwing from four lines of hose of five hundred feet, each giving satisfaction, etc. The resolution as amended was passed. The trial was made, and the election held, resulting in the engine being accepted by the city, and Messrs. Shawk & Latta were settled with after their long and persevering struggle.

The fact of the engine being subjected to so severe a test as throwing streams through four lines of hose, gives a better idea of the size of this machine, that nearly doubled the weight as originally contemplated, than sizes and figures can, to the general reader.

Although this engine was pre-eminently a success, it was but a step in the direction of the much more compact, easily handled, equally powerful, and more efficient engines of the present day.

That inventors are the first to discover the defects in their inventions, was true in this case, for both Shawk and Latta went vigorously to work on improvements, though not in the same direction, for, as I have before intimated, they differed radically in their views.

Mr. Latta would elaborate and improve on the machine that had proved a success; and, although he had abandoned making the engine a traction engine, he did not greatly reduce the weight. Notwithstanding the success of the engine, Mr. Shawk continued opposed to the square flat surface water space fire-box, of which he had a great dread, and was working on plans to dispense with it, and as much as possible reduce the weight of the machine. In a recent conversation with Mr. I. L. Whetstone, who was associated with Mr. Shawk in the lock manufacturing, about the time he purchased the Buchanan right and coil, and who, at the time of the disastrous explosion of the fire-box of the "Uncle Joe Ross," by which the engineer was killed, was one of the committee appointed by council to examine into the cause of that explosion, and who was associated with me in building locomotives for the Panama R. R., at the time the "Joe Ross" was being built. I spoke to him (Mr. Whetstone) of my having some recollection of Mr. Latta having called on us to consult in relation to securing absolute safety by stay-bolts, the flat surfaces of water space square fire-boxes. Mr. W. had no recollection of such an interview, and he thought my memory must be in fault, for he said Mr. Latta having built locomotives for Anthony Harkness must have had experience, and been fully conversant with safety stay-bolting. These remarks of Mr. Whetstone were so pertinent, that it made me doubt the correctness of my own recollection. I could not account for what had given me the impression, but on my return to my then home in Southern Illinois, a simple memorandum of having loaned Shawk & Latta stay-bolt taps and socket drills, recalled to my mind the entire circumstance, which was that Mr. Shawk and Latta came together to me, bringing drawings of the manner and distance apart of placing the stay-bolts; it was very evident that, notwithstanding the boiler was so far advanced, Mr. Shawk and Latta were not fully in accord as to the plans, for Mr. Shawk said to me that he would not feel easy unless some one whom he had confidence in would confirm the correctness of Mr. Latta, as to strength and safety. There was no difficulty in satisfying Mr. Shawk that, as spaced, if properly put in, they were abundantly sure of a much greater steady pressure than they

ever contemplated to carry. To that Mr. Shawk replied, "That is not the question; for in our forced generation of steam, to supply the strokes of the steam cylinder, the pressure will be more or less pulsative and rhythmical, and many times greater than a steady pressure." At this interview, Mr. Shawk seemed to be only partly satisfied by Mr. Latta agreeing to lessen the space and increase the number of the stay-bolts, and to make some changes as to corner bracing; but this did not prove sufficient, and the just cause of Mr. Shawk's dread was evidenced by the disastrous bursting of the fire-box of the "Uncle Joe Ross." I was absent from Cincinnati when this occurred, and I do not recollect of having seen the boiler afterwards; the engine was being exhibited to a committee of the fire department, I think of Chicago, when the explosion occurred. The nature of the fracture, as explained to me by my brother, Coleman Sellers, was that of a direct tear across the leg of the square fire-box, the boiler plate tearing loose from the stay-bolts, and turning out, and like a knife cutting off the legs and killing the engineer, John Winterbottom, who was standing on the footboard.

I have no certain knowledge as to the time of the dissolution of the firm of Shawk & Latta, but at the time of their practical demonstration by the "Uncle Joe Ross" of steam as a motive power for fire engines, a strong but unsuccessful effort was made to induce the city council to order another steam fire engine, and to abandon the entire volunteer system; both Shawk and Latta were separately working on their improved plans. "Father Collins" pursued the subject with great enthusiasm; he formulated a plan to have another improved engine built. He started a subscription among merchants, insurance companies and property holders; in this he had the assistance of Geo. Graham.

Miles Greenwood, at that time, had become chief engineer of the fire department and probably others; but, if my memory is not greatly at fault, the idea originated with Father Collins, and it was mainly due to his zeal and persistence that it was successfully carried out, and by that means the second successful steam fire engine was built by Mr. A. B. Latta, and presented to the city of Cincinnati, and named the "Citizens' Gift." At the time it was being built, Latta was constructing another on the same plan, although it was known at the time that Mr. Shawk was working to perfect plans in accordance with his ideas. It was natural that the works that had produced the successful engine should be looked to for others.

A Laredo, Texas, dispatch says:

At a meeting of the Board of Trade this evening, Messrs. Tarver, Urban and Penn were appointed a committee to wait upon the city council, and lay before them the many propositions of Northern and Eastern capitalists made to the Board of Trade to establish manufactories here, and to get donations of lands from the city as inducements. The manufacturing enthusiasm is unabated, and the city council will be very liberal. The mayor and many aldermen were present at the meeting, and all expressed themselves as strongly advocating the establishment of factories to consume the almost unestimated quantities of raw material raised here.

Science has, during the past twenty years, taught the people a good deal about water supply. Not that science has not often been wrong, but in the main its influence has been educational. There are a good many cities in the country where water supply was established years ago, since which time large towns have grown up above them, the sewerage of which has grossly contaminated their supply of water. Probably one of the hardest things to do is to convince the inhabitants of a city thus situated that the wisest thing to do in such a case is to go above the sources of contamination for a water supply. When a city refuses to get the best available water, a big mistake is made. The cost in dollars and cents is the last thing to be considered. The gain in health, and in the manufacturing interests vastly overbalance that.

Relative Velocities of Crank-Pin and Piston.

It is sometimes interesting and instructive to find the velocity with which the piston of an ordinary direct-acting engine is moving comparatively to that of the crank pin. The term, "velocity of the crank-pin," always means the velocity of its axis; and the velocity of the piston is that of any point in it; since the velocity of the center of the crosshead pin is at any instant equal to that of the piston, it is convenient to compare the velocity of the crank-pin with that of the crosshead pin instead of the piston. The velocity of the crank-pin we consider to be uniform; under these conditions the velocity of the crosshead pin will be variable, varying from nothing to a velocity greater than that of the crank-pin, and its greatest velocity will not be at mid stroke. Since the velocity of one end of the connecting rod is equal to that of the crank-pin, and the velocity of the other end of the connecting rod is equal to that of the crosshead pin, the problem will present itself in this form: The velocity of the crank-pin end of the connecting rod being given, it is required to find for a sufficient number of positions the velocity of the crosshead pin end. Hence our problem simply consists of finding the relative velocities of two points in the same body; and for the solution of our problem we employ a graphical construction as shown in Fig. 1.

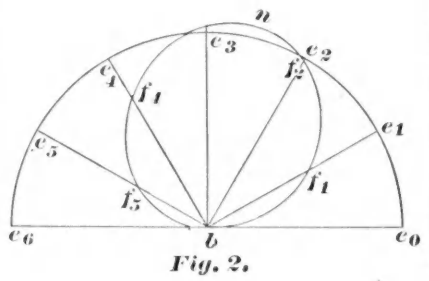


Fig. 2.

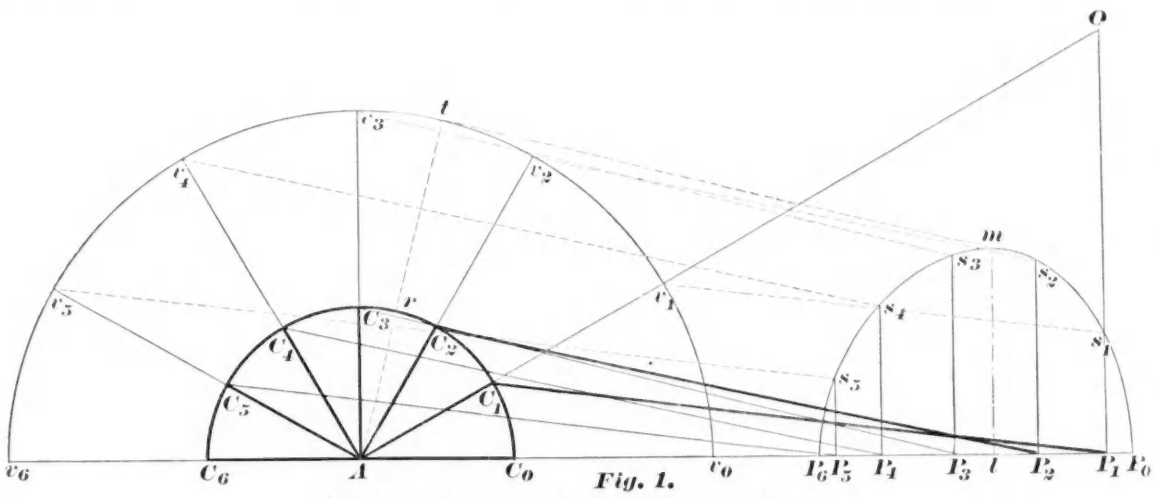


Fig. 1.

RELATIVE VELOCITIES OF CRANK-PIN AND PISTON.

Let our data be as follows: Length of crank = $1\frac{1}{2}$ feet; length of connecting rod = 6 feet; number of revolutions per minute = 56. The linear velocity of the crank-pin will be $2 \times 3.1416 \times 1.5 \times 56 = 527.78$, say 528 feet per minute; and $\frac{528}{60} = 8.8$ feet per second. Let it now be required to find the relative velocities of the crosshead pin during one stroke for seven positions of the crank at equal intervals of the same.

Fig. 1. From the center A, and with a radius of $1\frac{1}{2}$ foot, describe the semi-circle $C_0\ C_3\ C_6$; its circumference represents the path of the center of crank-pin during a single stroke; divide this semi-circle into six equal parts, and through the points of division C_1, C_2, etc., draw lines to the center A; these lines represent the different positions of the crank, for which we must now find the corresponding positions of the crosshead pin. From the points of divisions C_0, C_1, C_2, etc., as centers, and with a radius equal to the length of the connecting rod (6 feet) describe short arcs cutting the line of motion $c_6\ P_0$ in the points P_0, P_1, P_2, P_3, etc.; these points will represent the positions of the center of the crosshead pin corresponding to the positions of the centers C_1, C_2, C_3, of the crank-pin; and the lines $C_1\ P_1$, $C_2\ P_2$, which join the centers of the crank-pin and crosshead pin represent the center lines of the connecting rod. On the center line of motion lay off from the point C_0 a distance $C_0\ v_0$ equal to 8.8 feet; from the center A, and with a radius $A\ v_0$ describe the semi-circle $v_0\ v_3\ v_6$ and prolong the radial lines $A\ C_1$, $A\ C_2$, etc., to meet the circumference in the points v_1, v_2, etc. The lines $C_0\ v_0$, $C_1\ v_1$, represent the velocity of the crank-pin at each position of the crank, and since these velocities are equal at any instant, the lines $C_0\ v_0$, $C_1\ v_1$, must all be of the same length as we have drawn them. When the crank is at $A\ C_0$ the crosshead pin will be at P_0, and at that instant the velocity of the latter is equal to zero, for at that point it changes its direction of motion. In order to find the velocity of the crosshead pin at the instant it is at P_1 draw through this point a line $P_1\ s_1$ perpendicular to the center line of motion, and through the point v_1 draw a line $v_1\ s_1$ parallel to the center line $C_1\ P_1$ of the connecting rod cutting the perpendicular $P_1\ s_1$ in the point s_1; the line $P_1\ s_1$ measured with same scale as used for laying off the distance $C_0\ v_0$ will give us the velocity of the crosshead pin at the instant that it occupies the position P_1. In a similar way we find the velocities for any other position. Thus: Through the points P_2, P_3, P_4, P_5 draw perpendiculars to the center line of motion, and through the points v_2, v_3, v_4, v_5 draw lines parallel to each corresponding center line of connecting rod cutting the respective perpendiculars in the points s_2, s_3, s_4, s_5; the length of the perpendicular $P_2\ s_2$ will give us the velocity of the crosshead pin at the instant the crank-pin is at C_2; $P_3\ s_3$, the corresponding velocity for C_3, and so on. Join the points s_1, s_2, s_3, etc., by a curve; then any line drawn perpendicular to the line of motion $v_6\ P_0$, and terminating in the curve, will give the velocity of the crosshead pin at the instant it occupies the position of the foot of the perpendicular. If, for instance, we erect a perpendicular at l, then $l\ m$ represents the velocity of the crosshead pin at the instant it is at l, and since $l\ m$ is greater than any of the lines $C_0\ v_0$ or $C_1\ v_1$, etc., we know that the velocity of the crosshead pin at this particular instant is greater than that of the crank-pin. In fact, at l the crosshead pin reaches its greatest velocity, and by measurement we find it to be about 9.3 feet per second, or nearly 5.7 per cent. greater than that of the crank-pin; and we further see that when the crosshead pin moves from P_0 to P_6, its greatest velocity will be reached before mid-stroke.

To prove the correctness of this construction, step by step, will take too much space, we shall therefore simply point out some of the leading principles which enable the reader to conceive the demonstration. We may assume that the connecting rod rotates at any instance about an instantaneous center called the virtual center. For instance, let us consider the relative velocities when the connecting rod occupies the position $C_1\ P_1$; prolong the lines $A\ v_1$ and $P_1\ s_1$ so as to meet in the point O; this point will be the virtual center about which the connecting rod rotates at the instant it occupies the position $C_1\ P_1$; a line drawn perpendicular to $O\ P_1$ through the point P_1 will represent the direction in which the point P_1 moves; and a line drawn through C_1 perpendicular to $O\ C_1$ represents the direction in which the point C_1 moves; furthermore, it must be apparent that the velocity of the point C_1 must be as much greater than that of P_1, as the side $O\ C_1$ of the triangle $O\ C_1\ P_1$ is greater than the side $O\ P_1$ of the same triangle; these sides will give at once the relative velocities without drawing the line $v_1\ s_1$ parallel to the center line of the connecting rod. But it may be remarked here that the lines $C_1\ v_1$ and $P_1\ s_1$ lying between the two parallel lines $v_1\ s_1$ and $C_1\ P_1$ bear the same proportion to each other as that of the sides $O\ C_1$ and $O\ P_1$; and the advantage gained by obtaining the relative velocities from these lines will become apparent when we attempt to find the relative velocities for the next position of the crank-pin, namely when it is at C_2. Here again we prolong the lines $A\ v_2$ and $P_2\ s_2$ to meet in a point, which will be the virtual center of the connecting rod when it occupies the position $C_2\ P_2$, but this virtual center will be at an inconvenient distance from the connecting rod; hence we perceive the advantage gained by drawing through the point v_2 a line $v_2\ s_2$ parallel to $C_2\ P_2$, giving us the same ratio between the lines $C_2\ v_2$ and $P_2\ s_2$ as we should have obtained by the sides of the triangle constructed on the line $C_2\ P_2$ as a base. When the crank-pin is at C_3 the line $A\ v_3$ prolonged will be parallel to $P_3\ s_3$ prolonged, which indicates that the virtual center is at infinity; in this case the line $v_3\ v_3$ is equal to $P_3\ s_3$, which shows us that at this particular instant the velocities of the crank-pin and crosshead pin are equal. There is another position in which the two velocities are equal, namely when the triangle constructed on the center line of the connecting rod as a base is an isosceles triangle. Lastly, when the crank-pin is at r, the triangle constructed on the center line of the connecting rod will be a right-angled triangle, and the line $l\ m$ prolonged will be its hypothenuse, and therefore in this position the velocity of the cross-head pin will be greater than in any other position.

From any point b (Fig. 2) as a center, and with a radius of 8.8 feet, describe a semi-circle, divide it in six equal parts, and draw the radial lines, $b\ c_1$, $b\ c_2$, etc. Make $b\ f_1$ equal to $P_1\ s_1$ in Fig 1; $b\ f_2$ equal to $P_2\ s_2$, and so on. Join the points f_1, f_2, etc., by a curve, and thus obtain what is called a *polar diagram*. In this diagram the length of the line $b\ c_1$ represents the velocity of the crank-pin, and $b\ f_1$ (a portion of the same line) represents the velocity of the crosshead pin in the corresponding position. In a similar way, if we draw any radial line in this diagram, the part intercepted between the center b and the curve will represent the velocity of the crosshead pin for that particular position of the crank. The argument of the foregoing has been taken from Mechanics of Machinery, by A. B. W. Kennedy.

It is to be hoped that President Harrison's recommendation to Congress, regarding the use of automatic couplers on interstate railways, may lead to some action being taken regarding the matter. Our hopes of Congress taking immediate and decided action are not very strong, but at least attention will be called to the wholesale and utterly indefensible murdering which is going on with the old-fashioned coupling, and which will only be stopped by the pressure of public opinion and agitation, backed up by law.

Core Making.

BY S. BOLLAND.

THIRD PAPER—LOAM CORES ON BARRELS.

In my travels I have come across foundries where, in searching for a ring or flask in some out-of-the-way place, I have found old core barrels half buried and rusting away. Asking the reason of their being so far away from the shop, and why they were not in use, I have been told that the man who formerly made loam cores has died, or left for other parts, and, there being no one else in the shop able to make them, they have gone back to the sand cores.

Now I insist that no man is a thorough core maker who cannot make a loam core, and, as the business is so simple, I will, in a few words, show what must be done to secure good cores on barrels. In the first place, I have shown, at Fig. 18, a perspective view of the process, from the mounting of the barrel to the finished core. Barrels for small cores can be made of wrought-iron pipe, $\frac{1}{2}''$ holes being drilled irregularly along its length; for, should they be drilled in line, and too close together, they are apt to split the barrel in time; especially is this rule to be observed in barrels made of cast-iron. There must be a groove turned a short distance from each end, to fit bearing in horse, as shown at *A*, Fig. 18, so as to give a smooth, even turn, and insure a round core. When barrels are large, and it comes too expensive to make them of wrought-iron, they can be made of cast-iron, and the vent holes may be cast in. A very important feature in the casting of barrels is to have them strong enough; they should not be less than 1″ thick for a 12″ core. Care must be taken also to secure an even thickness all round, as they soon become useless from warping if there should be a thick and a thin side. It will be necessary to fit trunnions in the ends of large barrels, for the purpose of turning and lifting them; let them be as strong as possible, allowing plenty for trueing up in the lathe, which must be done after they are secured to the barrel, so as to insure an even body of straw and loam all round the core. The best barrel for the job—all else being satisfactory—is that which will allow from $\frac{3}{8}''$ to 1″ for rope, and same for loam. And in no case—to save a little extra trouble with the smaller barrel—choose one that will endanger the casting, on account of the ropes being too near the surface of the core; for, should your barrel be a little small, you can overcome that by an extra thickness of loam. But if you are making barrels for special use, you will be governed by the kind of job they are for.

Barrels made for thin pipes, say 6″ diameter and 9 feet long, must be from 4″ to $4\frac{1}{2}''$ diameter, on which you need only to run a little loose straw or hay. But should your job be a column or pipe 2″ thick and 15″ diameter, then you will require your barrel 11″ on the outside, to allow for about 1″ for rope, and same for loam.

We will suppose this to be the core you are going to make. After your barrel is ready place it in position, as shown at Fig. 18. You require a strong board or sweep that will rest on the horses, as shown in the figure, the front edge of which must be beveled to almost a sharp edge. This board, when set to the right distance, will be the outside of core.

Where large quantities of the same sized cores are made, there must be gauges or stops made to set the board, to insure the correct diameter, without the trouble of measuring with the calipers. There are 2″ to go on the barrel, 1″ of which will be rope and the rest loam. In making the rope it would be well to consider what it is for. In the first place it forms a passage for the gas to the holes in the barrel, and, secondly, it enables you to rub on your clay and loam more readily than you could do on the bare iron. But another important feature is that, when the heat has burned it out, it allows of the more easy withdrawal of the barrel.

Now commence to run on the rope, which is done by passing the end over and around the barrel, bringing it under the strand so that your rope will pass over it about three times, leaving it good and tight. Be careful not to have your rope too close, as, when that is the case, the only resistance which the core offers to the pressure around it is the 1″ of loam outside, there being no dependence to be placed on the straw, especially, as is often the case, if the core should get a little too much fire. By leaving a little space between, into which the loam can be rubbed, you have then as many studs as you have ropes, and consequently a good sound core. Keep the rope tight as you go, and when one ball is used up slacken the end you hold, as well as the end of the next ball; intertwine them, leaving some portions to be caught as you pass on to the end. When there, break off your rope and twist the loose straws around a spike nail, and drive it under and into the rope, taking care to keep it firm and tight.

The next operation is to cover the whole of the rope with clay made from good clay and old sand in about equal quantities, after which press down the rope with a weight held hard down, whilst the barrel is being turned round. This presses in the loose

Fig. 19.

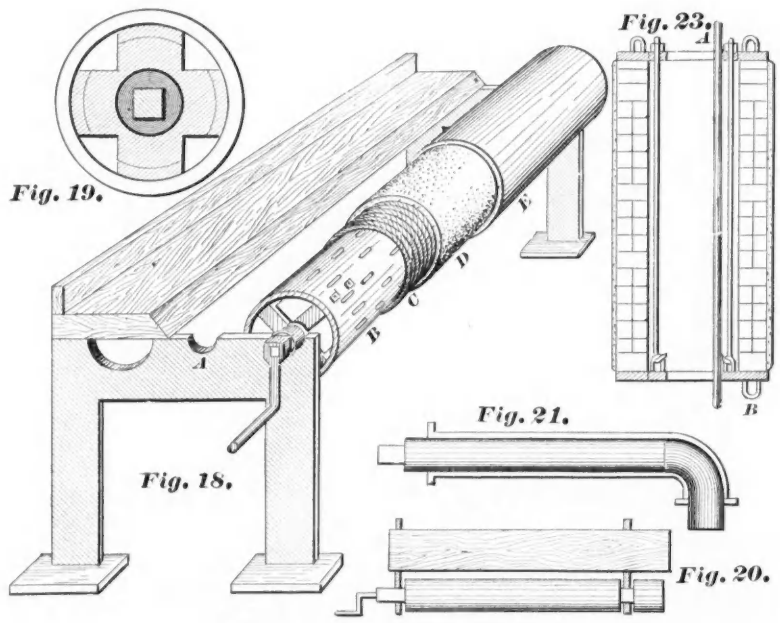


Fig. 18.

Fig. 23.

Fig. 21.

Fig. 20.

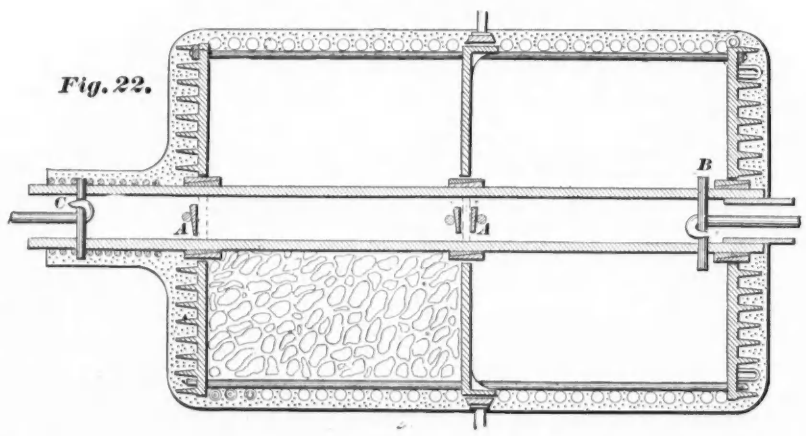


Fig. 22.

straws, and scrapes off the superfluous clay. After running your fingers along between the ropes, and scraping out the clay, you can rough up your core. As you have about 1″ to go on, you must divide that and set your board about $\frac{1}{2}''$ from the rope. Temper your loam to the right consistency, and rub it well on, turning slowly towards the sweep as you rub it on. When covered to board as set, remove the board, and lift the core from the horses and run into the oven. As soon as this coat is dry, set back on the horses. Set the sweep so as to bring the core within $\frac{1}{8}''$ of size; rub this coat well on, and when your loam is all on up to the board, clean off the sweep and set back $\frac{1}{16}''$, have some finely sifted loam to finish off, and, after finding your size correct, and whilst the core is being turned round, pull back the sweep sharply at one end, stop turning when the seam caused by the board comes to the top, and your core is then ready for the oven.

By observing the rules laid down it will take but a very short time to become an expert on loam cores.

In running up barrels with loose hay or straw, a little practice will be necessary Commence by rubbing a little clay on each end of barrel; pick up as much long straw as you can conveniently handle, and after making fast to one end as before directed, let the straw run from your hands on to the barrel as evenly as you can. When you come to the other end, if your hay or straw be soft and pliable, it can easily be made fast with clay, but should there be any difficulty in this, have some short lengths of tie wire to wrap around. Rub on the clay and press down with a board as it is turned, and proceed as before directed to cover with loam. These cores must be no more than dry, as if the straw should be burned the core would be loose on the barrel.

So far I have only spoken of the plain cores, but the use of barrels have a much wider range than this. I have known shops where from six to ten men have been constantly working on jobbing pipes from 2″ to 24″, and barrels used to the straight parts of them all; for in the case of elbows short turns can be made, and butted to the end of a loam core. Fig. 20 shows method of making body core in loam. The end of barrel stands past the horse from 6″ to 12″, to admit of the core being swept up to, and a little past the end of barrel; this allows for squaring to the body.

When the core is up to size, the top half of space can be filled up with loam, and as soon as the core is sufficiently dry to turn over, the rest can be made good. The end must be well plugged, and leveled off with sand after being squared, to prevent the iron from making its way into the barrel.

Fig. 21 shows cores together in mould. A little more care is needed in the anchoring in this case. Another plan is to fit a loose sleeve into the closed end to turn the core on, knocking it out when the core is finished, and plugging the end; but with delicate cores it does not act so well, as it shakes the core too much in driving out. When, on account of a neck coming into the core, you are obliged to use a very small barrel—and there should not be more than 6″ to go on—you may run a 1″ rope and one coat of loam on, and after drying repeat the operation until you get the required diameter, but never put rope on rope when you want a good sound core.

But should you have a core, such as an oil vessel, open only at the small end, which for a figure we will say is 6″ diameter, the body 24″ diameter, some other plan must be adopted. Procure a barrel not more than 4″ diameter, insert a plug or sleeve, to turn the core on, into one end. Should the core be about 3′ 6″ long, cast three plates $\frac{1}{2}''$ thick, 22″ diameter, and 5″ hole in center, full of small holes to allow the gas to pass through to the barrel, as well as to help in breaking them out of the casting. Cast prickers 2″ long on two of the plates, and about 1″ from the edge cast $\frac{5}{8}''$ holes every 3″ or 4″. By referring to Fig. 22 the disposition to be made of these plates will be seen.

After keying or wedging plates on the barrel in their proper place, with outside holes opposite each other, run some $\frac{1}{2}''$ rods through the bottom holes as it rests on the horses, and pack large cinders and coke between the plates as firm as you can up to the top, placing in the rods as you come along. Put a small wedge in a few of the top rods to keep them firm, and rub some loam all over without turning the barrel. Fill in the prickers at the ends with stiff loam, and dry well. When dry put back on the horses again. A little hemp rope run on the small end will answer in this case, as you have only an inch to go on. You must now run a straw or hay rope along the body, so as to leave 1″ of loam on the outside; rough it up as before directed, and finish. By a careful study of Fig. 22, which is a section of core when cut in halves, it will be at once seen how to make this core. It shows the plates keyed on the barrel, the middle plate having lugs cast on top and bottom to support core in the mould, as well as to keep it down. The staple is seen on the end plate for lifting purposes.

Should it be required to cast this on end, bolts instead of rods may be placed in three or four places, equally divided, with studs between, and the whole made secure to the barrel by inserting pins in the holes, firmly wedging between them and the plate, as shown at *A*. At *B* will be seen the way to lift the core on end; this small bar must be inserted before you pack in the cinders. When ready for the mould lift the core on the soft sand, and knock out the plug, being careful to clear away the loam all around it down to the plate; you may hitch on your hook and hoist on end. At *C* is seen the hook for anchoring down. After the core is in its place, the barrel must be filled with cinders to within 3″ of the top, and the hole made good.

Fig. 23 gives elevation of a brick core cut in halves. This plan may be adopted with safety where it would be advantageous. I have built cores in this manner from 18″ to 36″ diameter, and as long as six feet. Being firmly built and secured, they can be rolled over on the sand and lifted horizontally into the mould by the long bar *A*, or staples may be cast, on both top and bottom plates for that purpose as at *B*. Of course this plan is not confined to straight cores, as the brickwork can be adapted to any shape required.

In conclusion, I would suggest to the learner in this branch of the moulder's art, that he carefully and studiously think over the instructions given, mastering the principles that govern the various operations shown; by so doing he will be enabled to apply them every day in such a manner as will command a recognition only second to the best moulder in the foundry; in fact, I have no hesitation in saying that a first-class core maker is at all times the most important factor in foundry economy.

The *Electrical Review* says:

With all the paraphernalia of the modern physical and electrical laboratory, the instruments of precision that will handle a millionth of an inch as readily as a laborer his pick and shovel, etc.

The *Electrical Review* is one of the best papers of its kind in the world. But as a matter of fact there is not a mechanic nor a scientist in the land that can measure to the millionth of an inch. It is a nice thing to talk about, and all that, but when you come to measuring it, in the present knowledge of the arts, it cannot be done, either practically or scientifically. The reason why the jockey's horse could not trot a mile in two minutes was said, by the old turfman, to be because the distance was too great for the time. Reverse the statement a little, and it explains why a man cannot measure to the millionth of an inch.

LETTERS FROM PRACTICAL MEN.

Vacuum.

Editor American Machinist:

I notice in the issue of Dec. 5th, that Mr. W. H. Booth, in an article on running dynamos, recommends an arrangement to admit air to the condenser of the engine, so as to impair the vacuum to prevent the engine racing.

If an engine races when load is thrown off, it shows that the valves leak, and the proper thing to do, is to put them in order. If a valve is put in to admit air, the probability is that, if it opened very much, that it would get to leaking, and the vacuum be impaired.

It may be taken as a fact that, when steam is shut off, either by the throttle or the governor raising so high that the ports are not uncovered, as sometimes occurs inCorliss engines, that the engine immediately commences to run slower, even with first-class vacuum. We have a Corliss engine that simply runs a rolling mill; sometimes the load will be over 600 horse-power, and then all is liable to be thrown off instantly, leaving the engine to run alone. The condenser maintains a vacuum of from 26 to 28 inches. Surely greater variation would not occur in electric lighting. We never yet have had any trouble from racing, although sometimes the engine will run two or three revolutions without steam.

We have no isochronal attachment to the governor, and so have the variation of speed incidental to the old style of governing, nothing more.

Wherever the valves of an engine are tight, when steam is shut off, the unbalanced pressure will always be the highest on the exhaust side of the piston, with the tendency to retard the motion of the same.

W. E. CRANE.

Following the Same Plan.

Editor American Machinist:

In your issue of Dec. 12th is outlined a plan followed by the engineering students of Cornell University, in which students read the current literature, and report the results, etc., at a weekly meeting.

This plan has been followed here by the Gordon Engineers' Club for three years. I know that the benefits are great, and equal at least to the knowledge obtained from any single study.

JAY M. WHITHAM,
Prof. of Engineering.

Arkansas Industrial University, Fayetteville, Ark.

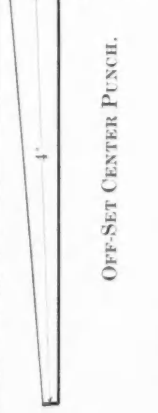
Off-Set Center Punch.

Editor American Machinist:

We have a handy tool in our shop, called an off-set center punch. It is made like the accompanying sketch. It should be made out of good cast-steel, ⅛ of an inch thick, and the point hardened.

Supposing you want to find the centers of a side rod, place your off-set punch and make four small dots, then use your dividers. This is more exact than by the use of "compass calipers." I give it for what it is worth.

A ROUNDHOUSE MAN.



Pins and Plates for Wooden Flasks.

Editor American Machinist:

The accompanying drawing represents a pin and plate for wooden flasks, and possesses improvements over any I have seen. Before I used these I had considerable trouble with wooden flasks on account of the bad pins which prevent the flasks from going together without hammering; or, on account of the pins becoming loose, causing them to catch or to shift, which, as all moulders know, means an addition to the scrap-heap.

Fig. 1 shows the top view of the plate; Fig. 2 is a sectional view of the pin, showing screw-hole for fastening it to the flask, and Fig. 3 is a sectional view of the plate. All moulders can see that the lips *A A*, which project on either side of the flask timber, serve two purposes; one is to strengthen the pin, and the other is to hold it firmly in its place. If the pin and plate are properly fastened, there is no possible chance of the flasks shifting, and since the pin and plate

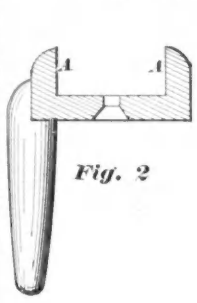


Fig. 2

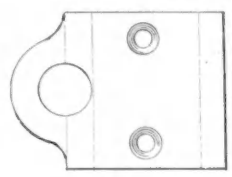


Fig. 1

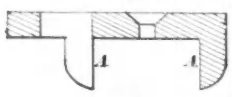
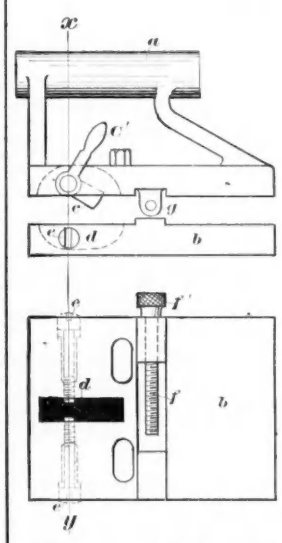
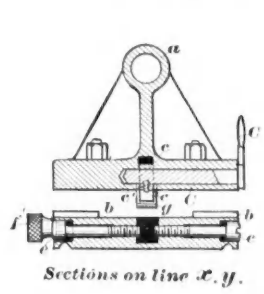


Fig. 3

are always in sight, there will not be any difficulty in closing the mould. I had the lips *A A* set 2½ inches apart, so as to admit strips between the lips and the side of the flask, making them fit any thickness of timber. I have used these pins and find them to give better satisfaction than any other; and I give the idea for the benefit of those interested in moulding.

JAS. R. ANDERSON.





Sections on line x, y.

Device for Aligning Lathe Foot Stock.

Editor American Machinist:

This device is designed to provide an easy and accurate method of setting a lathe foot stock to turn *straight*, after having been "set over" for taper turning, the usual method of setting the same by "scratch" marks on the casting being obviously unsatisfactory. The device can be applied to any ordinary foot stock, and the operation of it is so obvious, that but a short description will be required.

Referring to the drawings, *e* is the swinging stop, fitting closely in a milled slit in the casting *a*, and arranged to be placed flush with the casting, when the same is to be set over for tapers. When setting the lathe to turn straight, the stop *e* is operated by means of the lever *C*, attached to the rocking shaft *C*. The end of the stop *e* (which is hardened) passes closely between the hardened points of the screws *e*, *e*, when the proper position is reached; and should it become necessary to change the adjustment for any cause, the screws *e*, *e*, fitting tightly in their places, may be moved with little trouble. The arrangement of set over screw *f*, moved by knurled handle *f'* is considered desirable.

O. S. WALKER.

Grindstones, Blackboards, Belts and Chucks.

Ed. American Machinist:

Having been terribly perplexed recently with the emery wheel problem, remembering that at Steinlen & Co's., in Mulhouse—where they do the best machine work I ever saw—they use grindstones in every place where we use emery wheels—and remembering your remark made some months ago in a private conversation, "that you believed a grindstone, if only half as well fixed up as an emery wheel, was much better for grinding tools," I have been led to make a change back to the old original, and it appears now to be the greatest improvement we have inaugurated in five years. Our rig was one of the recent wet emery tool grinding machines, fitted for wheels 2½x18 or 20 inches. After the pump for returning the water gave out—which was in about three months or so—we improved that by coupling direct to the City Water Works.

After the emery wheels, which required turning once or twice a day, ended a $50 diamond, we had reached the climax and ordered an Ohio grindstone of the same size, and put it in the place of the emery wheel. It has a speed of about 3,000 feet per minute, and for grinding tools I have never seen an emery wheel that bears any comparison either in the speed of cut, the quality of work or consolation in using. At Mulhouse they used stones as small as three or four inches in diameter for grinding tools, where we have been using emery wheels for the same purpose. I do not suppose it is due to this, that they are able to do better work than we; but when such a thing is used in the best shop in the world, it may be worth while to ask if we have not *a few too many* left-handed improvements.

It may be that we have had very poor luck with emery wheels or extra success in procuring a stone; but when some one who reads this gets sick of buying $15 emery wheels, I hope he will try a $1 grindstone in the place of it, run it from 2,500 to 3,000 feet per minute, take equal pains and half the time to keep it true, and see if he does not feel happy.

Mr. Lipe, who has the faculty of finding a way to make things handy, has devised the best blackboard arrangement that has as yet come under my observation. It is one of the stand-out-on-the-floor sort, but in place of the black being painted on the wood, it has a roller at both top and bottom edges, passing over which is an endless band of blackboard cloth, so that, to one using it, the entire surface is available for one job; and instead of having to use a step-ladder for a part of the work, and standing on his head for another, he only has to run the band of cloth up or down to bring it to suit a convenient height.

Perhaps some draftsmen too lazy to draw anything but his salary may carry this same idea into a counterbalanced drawing-board. There is an old saying that there is nothing like leather, and this is often quoted by the men who sell leather belting. But until the cattle get to growing hides that are of uniform stretchability, there is, as at present used, a one-sidedness to single narrow belts not altogether satisfactory. Assuming that stretching the leather as practiced is an advantage, it would seem that cutting the strips from the hide, as shown in Fig. 1, would be an improvement. This would, no doubt, render the scrap less valuable, but when making the *best* belt is the aim, the value of the scrap should be a second consideration. The strips should not be cut parallel, but some say ½" wider at the ends than at the center; then, as they are pulled as near straight as practical, there will be enough surplus at the ends to trim straight, without removing any at the center, where the best leather should not be wasted. The idea is that the leather, which is the most sleazy, and needs most stretching, will get it in the manufacture.

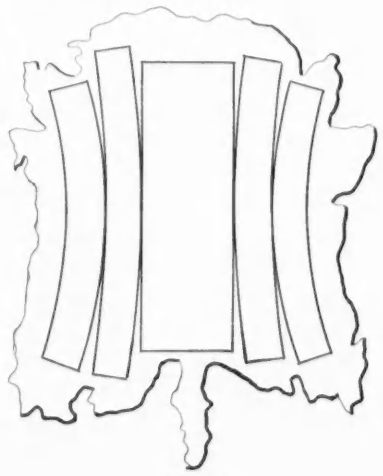


Fig. 1

A noted divine advised his students never to put more than three thoughts into a sermon. Perhaps that is good advice to apply to a letter, but as the above are small ones, another may be crowded in without detriment.

We have occasion to drill and tap a small hole in a rough casting of considerable size, which has to be finished all over from the hole or a rod screwed into it. The piece is rectangular in shape and irregular as regards the hole.

The trick was to so hold the piece in the lathe that the hole when drilled and tapped should be so located that there would be iron enough to finish at all points The plan adopted was this: A rectangular bell chuck, a little larger on the inside than the rough casting to be held was threaded on the lathe, and the outside surface dressed to the same shape as the finished piece, except one and one-half inches larger all the way around. Through each side of this chuck three set-screws are tapped, and each set-screw just 1½" long under the head. In use—when a rough casting is put in the chuck—it will be understood that the set-screws cannot all be run completely down, and that when properly set none of the screws would be completely down—whatever each set-screw lacked of coming down to the chuck would truly represent just how much surplus metal there is left for finish at that point.

In using the word "bell chuck," the thought occurs to me that possibly many of our young American mechanics, who have been brought up on the "three-jawed universal," may not comprehend what it is.

Any English machinist will be able to chalk one out—for in its simple form it may be said to consist of a piece of tube screwed onto the lathe spindle with several—usually eight—set-screws in it. For certain jobs it is no match for a universal three or four-jawed chuck, and for certain other jobs the universal is no match for the bell chuck. The cost is an excuse for the universal not being more universal in England, but stupidity seems to be the only excuse for our not knowing more about the merits of the other. I find Chordal, some ten or fifteen years ago, told about the same story as regards the grindstone, but it is one that will stand telling about frequently.

JOHN E. SWEET.

About Lathe Centers.

Editor American Machinist:

I have been interested in that "Cabinet of Curiosities" by Jarno, and should like to give my opinion through your columns: Jarno states that if they made a difference of one-thousandth of an inch to the foot in a year they would reach the standard after a while. That pre-supposes that the makers had agreed upon what the standard should be. But there is just the trouble. Each maker has a standard of his own which he considers perfect, and, of course, would insist upon his own standard being adopted.

The old custom, and the one most in use now, is when a lathe center becomes worn, or broken, the machinist has it annealed, turned in its place, and then has it hardened again. All this takes time, and is, therefore, expensive.

I have myself lost half a day before I got to work again. I have worked in a shop where the cabinet system was in use. It was the rule that if a workman needed a new center he was obliged to find the foreman and show him the old one, who would then give him a written order for a new one. I do not know what the object of this was, but suppose it to be a necessary adjunct to the cabinet system. Jarno proposes in one paper two hardened centers. The live center to be finished ground in its place. What I propose is to carry this a little further, and grind both centers by the use of the lathe attachment in the lathe where the center belongs. There could be one or two spare con-

ters kept in each lathe, fitted, and belong to that lathe as much as the change gears do. The workman might keep these centers in good repair without interfering with his other work very much. Then when a center became worn or broken, it could be replaced without loss of time. I am supposing that the workmen would be intelligent enough to know when their centers should be changed.

I can see where there might be trouble, even if the standard was introduced. Machinists are not all honest. Some are indifferent. They would not keep their standards correct enough to insure a good fit if the center was fitted to any other place from that intended for it. This might lead to a very bad state of affairs.

I have been able to remedy some very bad cases of chattering, by fitting the centers in better shape.

When center holes are made by the use of fine back drills and reamers they are liable to be crooked; in that case it is difficult to fit the center in good shape. I think that all center holes should be bored by the use of taper attachment, or a compound rest, to near the size, and then reamed enough to smooth the hole. I have found that if a center was turned down in the middle, so as to bear at each end of the hole only, it would be improved sometimes, especially if the hole was crooked. A MECHANIC.

Old and New Fashions.

Editor American Machinist:

It is said that fashions do not change, but are simply revived after a few years. How often this is true in mechanics. The old notion that, because a few burn their coal to carbonic oxide, that all must of necessity do the same thing, gives would-be inventors a chance to revive the various devices of admitting air above the fire, or turning the fire upside down to accomplish the same purpose, the latter plan claiming to do the work without the additional supply of air.

Forty years ago, in every saw and grist-mill in the land, wooden pulleys were in general use.

After mechanics became better understood, and our foundries were able to turn out symmetrical, light, cast ones at a moderate price, the old, cumbersome wooden pulleys went out of use. The cost of power was materially reduced by the change, on account of the lighter pulley having less surface for the displacement of air. There have been several attempts made to revive the wooden pulley, but with poor success. One of the latest advocates for public favor is probably the worst attempt of all. Heretofore all designs for pulley arms have recognized the importance of making the arms as light as was consistent with strength, and at the same time make them in such form as to present the least surface to the air.

This last design has flat arms parallel with the shaft, like the paddle-wheels of a steamboat. The superficial area of a 44-inch wheel, 16-inch face, for the displacement of air by the arms, is about 700 inches.

One of the claims of this monstrosity is that it can be fastened onto a shaft without keys. When we take into account the resistance of air under high speeds, it will be seen that a tight hold of the shaft is an important consideration.

They might also be handy in some places where a blower was wanted at short notice, as all one would have to do would be to box up one of these pulleys and stick on a pipe.

W. E. CRANE.

Condition and Prospect of the Machinery Business.

LETTERS FROM PROMINENT ESTABLISHMENTS TO THE "AMERICAN MACHINIST."

Brown & Sharpe Mfg. Co. (Machinery and Tools), Providence, R. I., write us:

Our orders during the present year have largely increased over the previous one. The works have run ten hours per day throughout the year, and 86 machine tools have been added. On the first of January, 809 hands were employed and the number is now 900.

We were awarded a "Grand Prix" at the Paris Exposition for our exhibit of machine tools. The prospects for a good business during the coming year seem very favorable.

Cooke & Co. (Machinery and Supplies for Manufacturers, Mills, Mines, Railway and Steamship Companies), New York, write us:

We are pleased to report that this has been a very satisfactory year in more respects than one. The volume of business has been large, and on our specialities, one of our principal difficulties has been to fill orders with reasonable promptness.

We have introduced the Beck automatic engine which we handle, into some of the finest buildings in this city and vicinity; and our trade for Roots' blowers, wood split pulleys, and strap joints, has been steadily growing. We had the satisfaction recently of sending a lot of these strap joints to England.

It seems to us reasonable to look for a brisk trade during the coming year, although the margins (as in the past) are likely to be very close.

Hill, Clarke & Co. (Machinery), Boston, Mass., write us:

We find business very satisfactory; our orders are not confined to any particular part of the country. The demand for machinery seems to be equally good from all sections.

Charles R. Vincent & Co. (Ball Automatic High Speed Engines, Skinner Throttling Engines, Reynolds-Corliss Engines, Boilers, Heaters, Improved Steam Heating Apparatus, etc.), New York City, write us:

Personally we have every reason to be satisfied with the condition of business in '89. Our sales are nearly, if not quite, double those of last year, and the inquiry still remains good. In steam engineering we find a decided movement in favor of higher pressures, and of the use of steam expansively. The small engine trade is dropping off, owing, doubtless, to the large increase in the number of electric motors used. In the country, however, the demand still remains fair for small powers for manufacturing purposes.

We think the condition of business in general is healthy, and we anticipate that we shall have all we can do in 1890.

Watson & Stillman (Engineers, Manufacturers and Machinists), New York, write us:

Our report of business condition, written last year, is a very good one for us to copy now. Our enlargements have been in wood-working departments only. The larger amount of new work coming to us has twice compelled us to get more room for pattern making. Several new lathes have been put in during the year, and a small monitor lathe has been added, which is to be followed by a 21" one, for which order has been placed, and a new lathe, in which work 6 ft. diameter can be swung, is now on its way to the shop. More varieties of hydraulic presses, valves and fittings, have been added to our lines than in any two previous years, while improvements have been made in most of the others.

The volume of business has naturally been much larger than before, and our placing in more machinery is a good pointer as to our judgment of business in 1890. The preparation for the N. Y. Columbus Exhibition of 1892 will make business good for 1891, while the exhibition will take care of 1892.

The prices we are paying for labor and materials are about the same as last year, on the average, while the lower prices obtained for goods have to be met by improved tools and methods.

S. W. Lord & Co. (Boiler Compound), Philadelphia, Pa., write us:

The end of the year 1889 finds us with an ever increasing business, and we have on hand for immediate shipment orders aggregating 20,000 lbs. of our boiler cleansing compound, and our prospects for the coming year are of the brightest.

Our chief difficulty in getting new customers hitherto has been to overcome the prejudice many steam users have against boiler compounds, because previously they have tried articles under this name, generally in a liquid form, that have totally failed to do anything promised by those who sold them; but, by the aid of smart salesmen and liberal inducements for trial orders, we have lately succeeded in introducing our compound into the boilers of many of the largest rolling mills, and other manufacturing establishments in the country, with very satisfactory results.

We have lately come across an article which, added to the other ingredients of our boiler compound, will make it very suitable for locomotives working under high-pressure, and with little steam room, and in future we shall give particular attention to this branch of our business. The little book we give to engineers has been highly appreciated, and our ad. in your columns has brought applications for it from many distant countries, including Australia and India. Having exhausted our supply of the books, we are making arrangements to get out another one, which will contain much information useful alike to engineer and steam user.

The Middletown Machine Co. (Lathe Dogs and Safety Set Collars), Middletown, O., write us:

We have found it necessary to erect new buildings in the spring, in order to give orders more prompt shipment. At present we are well-stocked with orders, and the coming year promises to excel the last year. We have our new circulars, which we would be pleased to send to any one in need of our two specialties.

The Fitchburg Machine Works (Metal-working Machinery), Fitchburg, Mass., write us:

We have been full of business for the past year, and have not experienced any "dull times." With the exception of Saturday afternoons through the summer months, we have run our works to their full capacity, and for the past few months we have been obliged to run considerable extra time.

Customers do not anticipate their wants as we would like to have them do; it is not always pleasant to ask a man to wait several weeks for a machine that he wants for immediate use.

We have brought out several new tools and made many changes and improvements in our old patterns; we propose to make some very radical changes in our English lathes in the next year. We find that the demand is for improvements all the time, and the manufacturer who is satisfied to follow the same line year after year, with no change or improvement, will bring up in the rear.

The indications are that there will be an early advance in prices for machine tools; we are paying more for stock, and the margin of the past few years will not admit of an increase of cost without an increase in the selling price.

We think there is every indication of a successful business for the coming year.

Wm. L. Simpson, Keystone Engine and Machine Works (Engineering Specialties), Philadelphia, Pa., writes us:

We are pleased to say sales of centrifugal exhaust heads, and centrifugal steam separators are steadily on the increase. I have established a plant for building and furnishing of above, independent of the machine business, permitting us to fill orders for same more promptly. Orders for Keystone double plunger pumps and orders in machine shop keep us very busy in this department. We are well pleased with the outlook.

Darling, Brown & Sharpe (U. S. Standard Rules, Patent Hardened Cast Steel Try Squares, and a variety of tools for accurate measurement), Providence, R. I., write us:

The demand for our tools during the present year has been equal to our capacity of production, and prospects for 1890 seem flattering.

The Trump Bros. Machine Co. (Light Machinery, Finished Hexagon Nuts, Stud, Coupling and Tap Bolts), Wilmington, Del., write us:

We are glad to report a very satisfactory year's business for '89 which shows a material increase over that for '88.

Orders in hand are not so "crowded" as we would desire, but those in prospect give us reason to believe that '90 will start off well.

We have added several new tools, some of our own design, and have increased our facilities for doing more and better work. Material and labor have advanced in cost, but the prices for our manufactured products are about the same as for '88.

We note a very gratifying increase in the sales of our finished hexagon nuts and chucks; also our lathe center grinders. Have added several improvements in our knitting machinery lines, which we think will be appreciated. Have averaged about usual number of hands for the year.

Nicholson & Waterman (Machine Tools), Providence, R. I., write us:

The close of 1889 will show a volume of business nearly double that of 1888. In addition to our machinery for finishing nuts and bolts, we have increased the number of sizes of lathes we build, by the addition of larger sizes, and have also added a line of boring machines; machinery for which latter purpose we have devoted much time to. We have added a pattern storage and pattern shop to our present capacity.

The outlook for 1890 is very good, both from the volume of orders in hand, and the prospective orders in view.

Pedrick & Ayer (Universal and Plain Milling Machines, Special Tools for Railway Repair Shops, Portable and Stationary Cylinder Boring Machines), Philadelphia, Pa., write us:

The past year has been an eventful one with us; during same we have erected a new shop, increasing our facilities fully 75 per cent., and have been for several months past moved and settled. We have purchased quite a number of new machines to facilitate our work, and have added several very valuable specialties to our line of railway and machine shop tools. Our working force during the past six months has increased 50 per cent.

The sale of our heavy universal milling machine has been good from the start, and the number of sales has gratified us very much. We have duplicated orders for same for several of our customers; the demand is on the increase.

Our special tools for railway repair shops have been in good demand. Our old shop is now used as a repair department, and is run independent of our new shop; business in this line has been very good. We expect soon to be on the market with Richards' patent open-side planer and shaper, having made arrangements for the manufacture and sale of this valuable machine.

The prospect for trade for 1890, is in our judgment very good indeed. It is our intention in the spring to add two more stories to our new shop. We are obliged to do this to properly and economically handle our increasing line of specialties.

The New Haven Manufacturing Company (Machine Tools), New Haven, Conn., write us:

So far as we are concerned here, we have had a good business all through the year; there has been no time when we have not been well ordered up, and as busy as we could desire. At present we have an unusual accumulation of orders, and the prospect is good for a very heavy business as far ahead as we can see. We are constantly bending all our energies to the improvement of our productions, and are encouraged to find that our efforts are appreciated and that our productions seem to be giving universal satisfaction to our patrons. The constant advance in the price of material, in our judgment, points to an early advance in the price of manufactured products.

The Jones & Lamson Machine Company (Machine Tools, Die Sinking Machinery, etc.), Springfield, Vt., write us:

It has been a trifle over a year since we removed our entire works from Windsor, Vt., to its present location. At that time we increased our plant by the addition of much new machinery, and now run seventy-five men where formerly we had thirty-five.

We increased our capital from $35,000 to $60,000, and are now running the force we have on hand to their full capacity, with over $17,000 worth of unfilled orders ahead. We are building over $100,000 worth of machinery and small tools for the Pennsylvania R. R. Co., the most of which goes to their new shops at Altoona, Pa. Our small tool department has become one of the prominent features of our business, and includes many new patented articles that are creating much interest. Among these is our taper box tool for making taper bolts, studs and irregular forms without centering, as on a lathe. This will be used extensively in locomotive shops. Our new roller feed and automatic chuck, which enables the operator to work up round, square and hexagon stock from the continuous bar into bolts, nuts, screws, etc., without stopping the machine. This roller or wire-feed works equally well on square and hexagon stocks as on round. Our second-end attachment is another one of our new patents. This is attached to our regular turret screw machine, and makes that machine able to finish, mill, thread or drill the second end of work, while at the same time working on the other. With this attachment studs can be turned out with only one handling, and makes the tool a fair competitor with an automatic machine, and still have a regular turret screw machine.

Many minor improvements have been made in our tools, and we now make the most complete and extensive line of turret screw machines in the market. We make ten sizes, handling from ¼ inch diameter to 3¼ inches diameter, besides making all kinds of brass lathes, turret chucking lathes, and turret lathes proper. We have agencies in Boston, New York, Philadelphia, Cincinnati, Cleveland and Chicago.

The Laidlaw & Dunn Company (Pumps, Tobacco Machinery, Pipe and Fittings, Rail-

road and General Supplies), Cincinnati, Ohio, write us:

We are pleased to state that our business during the year 1889 has been the best we have ever experienced. Orders have been very plenty, although at very low prices. Our prospects for the year are exceptionally good. We are increasing our plant right along, to enable us to keep up with our accumulation of orders. We are at present putting in some new machinery, and increasing the size of our plant. There has been no change in the price of labor, but, of course, material is advancing right along.

The Collins-Goodin Mfg. Co. (Wire Machinery and Tools), St. Louis, Mo., write us:

We have to report a fair trade for our wire-straightening and cutting machines and tools this year, considering they were new. We have recently put on the market a new and improved automatic machine, which meets with great favor, and present indications justify us in the belief that we will sell a large number of them this coming year.

William Lowe, Bridgeport Boiler Works (Boilers, Heaters and Plate Iron Work), Bridgeport, Conn., writes us:

Our regular patrons and those gained kept our facilities fairly employed through the spring and summer months, and filled them full in the fall months, and now they are filled generally for several months ahead.

The outlook for a good business is quite promising, and will culminate (we believe) in a good and more profitable period, if those who have been doing business at more remunerative prices, manufacturers and raw material producers, do not tax the people and users too much and too often to recover or make good what they have lost, or make haste to obtain an unreasonable profit. This is what is called a boom, or booming it, the sure result of which is to shorten the period of prosperous times. It is far better to hold back and let business come up to a healthy state slowly, and lengthen as much as possible the period of prosperity, but we cannot hope for this, because no power on earth can prevent wild speculation, crazy competition and unnecessary increase of facilities, till the force of circumstances caused thereby brings things to a head, and then the boom is over, and the period of prosperity shortened every time, in my experience, and the older the country grows the less full time there is for both manufacturers and workmen. Our business is mostly orders for our specialties. Of the Lowe boiler, we have made some large plants this year, and have now in the works a number of orders for 525½ feet boilers with all improvements. On the heater and purifier we have done very well, and sold to parties we could not reach before, which has made this part of our business very good and promising.

The Standard Regulator Co. (Engineering Specialties for Steam, Water and Gas), Buffalo, N. Y., write us:

We are pleased to report a rapidly increasing demand for our reducing valves, pump pressure regulators, etc., and to say our business outlook for the future is very promising.

The Dean Brothers Steam Pump Works (Steam Pumps and Water Works Machinery,) Indianapolis, Ind., write us:

Our business during 1889 has been about twenty per cent. larger than the previous year. We expect a still further increase of business during 1890.

James Leffel & Co. (Steam Engines and Boilers), Springfield, Ohio, write us:

We have enjoyed a very fine trade throughout the season of 1889. It continues exceptionally large with a fine promise of holding out through the entire winter season. We are now running our works until ten o'clock at night and experience great difficulty in keeping up with our orders.

Hugo Bilgram (Engineer and Machinist), Philadelphia, Pa., writes us:

During the latter part of the year (1889) I have been engaged to my full capacity.

I have increased my facilities by the addition of new machinery and appliances.

In the gear-cutting department I continue to be actively employed, being exceptionally busy on bevel gears. I am increasing my facilities to meet a rapidly increasing demand for bevel gears with planed teeth.

Timothy Kieley (Steam Traps, Pressure Regulators, Pump Governors, etc.), New York, writes us:

My business for the past year shows a decided increase over that of the year previous.

The sale of Kieley's positive acting pump governor, and that of the improved Eureka pressure regulating valve, has increased almost 100 per cent. That of Kieley's patent back pressure valve about 40 per cent. Return steam traps remain about the same. For the past three months my facilities have been taxed to the fullest extent in filling orders as fast as they came in.

The D. E. Whiton Machine Co. (Gear Cutters, Centering Machines, Lathe and Drill Chucks), New London, Conn., write us:

The volume of our business for 1889 will exceed that of any previous year, with which fact we are well pleased. It has been a year of considerable improvement in our processes, and we have added a number of special machines of our own design, which have greatly facilitated production in some of our lines. We have also increased our force of workmen somewhat, and have now in our employ some of the most skillful men in our line to be found anywhere. We have remodeled our office arrangements on a greatly improved plan, and have added a receiving and storage room for our raw materials and supplies, which we think to be a model for order and convenience. These changes have given us a considerable increase of available floor space, and are proving to be of great advantage. In machinery we have brought out a new centering and drilling machine, for which we have been allowed a patent, and which we are just getting in shape to introduce more extensively. Our exhibit at the Paris Exhibition has resulted in a considerable increase of foreign correspondence, and our export sales are constantly increasing.

Prices of our raw materials remain about the same as heretofore; we have made some adjustments in the pay of our workmen, but on the whole no material change has taken place in this regard. Prices of our products have fallen off somewhat in certain lines, but our policy is to follow rather than lead in this matter, and we desire to protest against useless cutting of rates, which we think has been indulged in to some extent during the year.

We are gratified to note the continuance of the favor with which our new Independent Chuck has been received, and we think that, mechanically considered, our improved construction is the very best yet offered.

We are carrying a considerable number of unfilled orders over into next year, and we regard the outlook for our business as very favorable indeed.

Luscomb & Corey (Upright Drills, Special Machinery and Tools), New Bedford, Mass., write us:

Business with us the past year has been about the same as in 1888, but at times we have felt the need of more complete accommodations, and in September we added some machine tools and numerous small tools to our plant—about the same amount as in 1888. During the year we have brought out our new 16″ drill press, which, to use the expression of one of the largest machinery dealers, "is the only machine lately put on the market that is an entire novelty," and which is meeting with much favor among both dealers and users. We look for a good business in this line the coming year, and intend to bring out other tools for machinists' use.

We have also been fortunate in securing contracts for work for the coming year, so that, altogether, we think we have cause to look forward to a prosperous future in 1890. The price of labor here remains about the same, but we notice an inclination among metal dealers to raise their prices a little.

The Albany Steam Trap Company (Return Steam Traps, Pumps and Pump Governors, Filters, Phosphor Bronze, Renewable Seat Stop and Check Valves, etc.), Albany, N. Y., write us:

As a whole our trade has been about the same as last year. Our filter trade has increased some, and we have lately taken orders from parties in Chicago, Ill., Omaha, Neb., Kansas City, Mo., Birmingham, Ala., Vicksburgh, Miss., Dallas, Tex., Troy, N. Y., Pittsburgh, Pa., Philadelphia, Camden, N. J., and many other places, besides our home trade, which has been very satisfactory. Our new pump and governor has stood the season's test with excellent results, and we anticipate a large trade in that line as soon as we can get the special tools ready to enable us to turn them out faster; as it was, we had to refuse many orders that we could not fill.

We have about finished moving into our new and more spacious quarters, and are now located at 60, 62 and 64 Church street, and with our increased facilities for turning out our specialties, we anticipate a good year's business in 1890.

The Pittsburgh Reduction Company (Pure Aluminum), Pittsburgh, Pa., write us:

We have found the increase for the demand for aluminum goods very rapid within the last few months, since we have been advertising to the world that we are ready to sell aluminum at the rate of $2 per pound. Our plant is capable of turning out about 60 pounds of metal per day, and the present output is severely taxed to keep up with the orders. We are now making arrangements to increase the output to over four times its present capacity, and will also put in a foundry within the coming spring, to furnish aluminum castings.

We find the metal is very easily handled in making castings, and that there is a large and growing demand for this class of goods, as well as for the metal in sheets, wire, tubing, and the like. We are now looking for the best form of dynamos. We are wanting two dynamos of about 2,500 amperes by 50 volts, or machines of about that capacity.

The Stiles & Parker Press Co. (Presses, Dies, Drop Hammers and General Sheet Metal Tools), Middletown, Conn., write us:

We are pleased to state that our business for the past year has been increasing constantly, so that we have been compelled to put up an addition of 100x50 feet, which we intend to supply as soon as possible with the latest manufacture of tools. The Paris Exposition has been most satisfactory, we having been awarded not only a gold medal for superiority in our line of tools, but we have taken many orders, and are doing a larger foreign business to-day than we have ever done before.

The coming year promises to be a very busy one for us, and the present outlook is that we will be obliged to run over time to keep up with the demand for our tools.

H. C. Pease & Co. (Machine Tools), Worcester, Mass., write us:

Yours of the 10th at hand: in reply we will say our business for the past year has been, as a whole, very satisfactory. We have added new tools, and have done a good deal in the way of new patterns and special appearances to make our work better and cheaper. Our pay roll is much higher than it was a year ago, at the present time. Orders are plenty, and the outlook for the future is good.

Boynton & Plummer (Machine Tools), Worcester, Mass., write us:

The past year has been fairly satisfactory to us; can only hope that 1890 will prove equally so.

The Barr Pumping Engine Company, Philadelphia, Pa., write us:

The condition of our business is very good at this time. We are full of work, and have been all through the summer; we have work enough now to carry us through the winter, and the outlook for business seems to us to be very promising. There has been an advance in the several materials which enter into the construction of pumps, but we do not note any changes in the price of labor, except such as is always in process of adjustment.

H. Bickford (Boring and Turning Mills), Lake Village, N. H., writes us:

My business for the past year has been very satisfactory, and the outlook for 1890 is such as to warrant increased facilities.

The Lexington Gear Works, George B. Grant, proprietor, Lexington, Mass., write us:

During the past year I have built a new shop in this place, where the heavier part of the business will be done under the above name. I have also moved the old city shop to a location in the center of the business part of the city, and shall there do the lighter part of the work, and the Boston jobbing, under the name of The Boston Gear Works.

The business has increased perceptibly during the year, as it has during every year for the last ten. The present increase is in the direction of iron list gearing and heavy work in general, for which I am now very well prepared. The public will eventually use ready-made gears just as universally as they now use ready-made machine screws, and for the same reason: that they are not only better but cheaper than the average gear made to order. The manufacturer who makes a specialty of any article, no matter what it is, has an advantage over the one who makes the same article as a casual job.

The American Gas Furnace Company, New York, write us:

We can only say that our business has been very satisfactory this year, and that orders and inquiries now on file in our office indicate excellent prospects for 1890. Our sales have been limited only by our capacity to produce, and we are not over half big enough to meet the demands upon us. While our business is a new one, having distinct features which would secure us some demand even in dull times, it is evident that the general condition of the mechanical industries must be good, when a demand for a thing that will *save time* and *facilitate production* is so general as we have found it. While we suffer from "a surplus" (—of orders), largely due to the widespread publicity given us through the columns of the AMERICAN MACHINIST last month, we base our opinion that 1890 will be an exceptionally prosperous one, upon the fact that there is not a single manufacturer, in any of the many lines of business which we supply, who has not found his facilities taxed to their utmost capacity to supply a legitimate demand. We are not in position to give you specific facts, having a general interest, and only write this to confirm, by one vote more, the verdict of your patrons which we anticipate will be unanimous, and to this effect: "1889 was good, and 1890 will be still better."

The Hall Steam Pump Company, New York, write us:

The year 1889 has been a busy one with us. A fast growing trade, that taxed our manufacturing facilities to the utmost for the past year, made it absolutely necessary for us to increase our works very much; more than was possible on the ground we occupied. It was finally decided to locate the new works at Pittsburgh, Pa., and ground was broken last July for a shop and foundry 4 or 5 times the capacity of the old one. We have now been in it nearly two months and everything working very satisfactorily. We are still behind orders and can see no certain time when we will be able to catch up and get a proper amount of stock ahead. The prospect for 1890 is very pleasant, as we feel assured of a large trade and are well equipped to take advantage of it.

Schleicher, Schumm & Co. (The "Otto" Gas Engine), Philadelphia, Pa., write us:

We have to say the beginning of last year did not show a brisk demand, but it improved towards the end of the year and present prospects for the coming year seem exceptionally good.

C. B. James (Fine Machinist Tools), Chicago, Ill., writes us:

Regarding trade in general, I do not consider my opinion to be of nearly so much importance as that of houses longer established in business, but I can see no well-defined reason why the volume of business for the ensuing year should not fully equal that of 1889.

About eighteen months since, I embarked in a strictly fine tool and cutlery business. It was a "new departure," as I carry in stock neither machinery supplies or hardware.

The results so far have been quite satisfactory, showing a steady increase in the volume of sales from the commencement. I have, however, felt the need of a catalogue very much, but am now distributing advance sheets, or the first 72 pages, devoted exclusively to fine tools for *accurate measurement*.

While complete in themselves, these sheets form but a comparatively small part of what I intend making a most comprehensive catalogue of fine tools and appliances best suited to the requirements of all who are engaged in any branch of mechanical industry.

During the past year several new tools, possessing merits of a high order, have been placed upon the market; notably the B & S. Co's. beam caliper, and L. S. Starrett's new speeded micrometer caliper with locking device; and I am myself introducing a new tool for wood turners, named "the Hustler." It is illustrated and fully described on page 79 in my new catalogue.

The Betts Machine Co. (Makers of Metal Working Machine Tools for Railway Bridge and Machine Shops, and Iron Works generally), Wilmington, Del., write us:

Business with us for the last half of 1889 has been very good. The prospects for 1890 are excellent. We are running our works night and day to keep up with our requirements.

The Hoppes Manuf'g Co. (Feed-water Heaters and Purifiers), Springfield, Ohio, write us:

We would say that the year 1889 has marked great progress in our business, as we have, during the year just about to close, added several very valuable improvements to our exhaust steam feed-water heater, which has increased the sale in that branch of our business beyond our present capacity of production. We have also during the past year brought out and put on the market a new and distinct style of both our live steam purifiers, and also exhaust steam heater, whereby we can furnish in one machine capacity up to 3,000 H. P. The manufacture of these special large sizes will necessitate our making extensions in our manufacturing facilities, which we will most likely begin in the early spring.

Prospects for 1890 are very encouraging, and we anticipate a very large increase in our business.

(Several letters stand over.)

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.*

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NEW YORK, JANUARY 9, 1890.

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The Advantages of a Well-organized Drawing-room.

The necessity of drawings for furnishing the mechanic with the information required for shaping the material, and for placing the different pieces in their proper positions, we believe is acknowledged by all who are familiar with machine construction; it is also a recognized fact that, in order to prevent a waste of material and labor when a new machine is to be built, it is absolutely necessary to lay out on paper the movements of the different parts of the machine, and making such provision as will enable each part to perform its proper function and move in the path assigned to it, without being detrimental to the actions of other pieces. The excellent record which can be kept by the means of a good set of drawings is also appreciated, but sometimes not to an extent as the importance of such records demands. Yet, with all these recognized advantages which may be derived from a well-organized drawing-room, its force is sometimes reduced below the minimum, and remunerations offered are such as will cause men of ability to seek other professions. This course conveys the impression that draftsmen are a necessary evil, and that the salaries paid to first-class men add to the cost of production. In our opinion, a more erroneous course cannot be adopted, and it seems to us to be the result of looking at facts in only a superficial manner. Any work that can and should be done in the drawing-room, and is not done there, throws more labor on the men in the shop, and particularly so on the foremen, who, not having the facilities of doing drawing office work, become overworked and worried, and, as a natural result, the work will lag, the cost of production be increased, and the chances are that when the work has been completed it will be a source of disappointment and an injury to the reputation of the employer. The same and worse results will follow by employing draftsmen who do not know their business. Nothing can have a more depressing and demoralizing effect than the frequency of mistakes in drawings. No matter how industrious a mechanic may be, it is irksome to him to be led astray by worthless drawings, and be compelled to do the work a second time. If incorrect and incomplete drawings are the rule rather than an exception, the workmen are liable to lose time by consulting with each other, or with the foreman, continually laboring under an apprehension that something may prove to be wrong, that their labor may be wasted, and using such precaution as to interfere with the proper performance of their duty. Certainly no good mechanic can be blamed for feelings such as these, when he knows the drawings are worthless or do not give him the information which he requires. The blame should be placed where it belongs—in the drawing-room. If on the other hand, intelligent men of honor are employed as draftsmen, men who thoroughly know their profession, others have no business in the drawing-room, and an appreciation of their services is shown by a remuneration which will enable them to live in comfort, the character of the drawings will be such as to inspire the workmen with confidence and incite an energy in the manner of doing work, remove the irritability of the foremen, promote harmony, all of which will lessen the cost of production, and will be creditable to all concerned.

Our Merchant Marine.

It is reported that the New York Board of Trade and Transportation, co-operating with what is known as the American Shipping and Industrial League, has sent to the various business organizations of Boston a form of resolutions to be adopted by them, and forwarded to Congress, the resolutions asking that the government shall grant to American vessels engaged in foreign trade, a bounty of thirty cents per ton, for every thousand miles of distance sailed by them in making voyages to and from this country.

Any wise measure that will restore to us our merchant marine, and also give an increased activity to our iron shipyards, and permanently establish many more, will undoubtedly be endorsed by every citizen of the United States. A successful merchant marine service will require iron ships, because they will carry more on the registered tonnage when built, the period of usefulness is much longer, and the cost of keeping them in serviceable condition is much smaller than that of wooden ones. At present the bulk of the iron shipbuilding business is done on the Clyde. Ships can be built there for considerable less money than here; yet in this country we have the talent and the mechanics to build as good an iron ship as can be built anywhere else, and this fact is proved by the ships lately added to our navy. The whole obstacle to an increased activity in our shipbuilding business is that we cannot compete with foreign builders, and this state of affairs is certainly no fault of the mechanics. Hence, before the proposed measure is passed by Congress, will it not be well to consider whether this measure will be a step towards a genuine building up of an American merchant marine? Will it be beneficial to the shipbuilding interest? If not, is it right to take each year, probably, some millions out of the taxpayers' pockets? If this measure is adopted, will it be a dangerous precedent? And lastly, will it be beneficial to the greatest number of our citizens? We shall watch with interest the course which Congress will pursue in the matter.

Horatio Allen.

Horatio Allen, the well-known engineer, died at his home in Montrose, N. J., on Dec. 31, 1889. He was born in Schenectady on May 10, 1802. He was graduated at Columbia College in 1823, taking high honors in mathematics. He at once turned his attention to civil engineering, and entered the service of the Delaware & Hudson Canal Company, the great engineering enterprise of the time. A few years later the news of the success of George Stephenson's locomotive reached this country, and Mr. Allen resigned, to go abroad to study the new motive power. Just before he sailed from New York, he was appointed purchasing agent by the Delaware & Hudson Canal Company, to buy iron for the sixteen miles of road it was then building, and also—a far more important commission—to purchase three locomotives. Mr. Allen landed at Liverpool early in 1828, saw George Stephenson, and entered into negotiations with him. Two locomotives were ordered from him, and one—the famous "Stourbridge Lion"—from Foster, Rastrick & Co., of Stourbridge. The engines arrived in New York in the winter of 1828-9, but the river and canal being closed by ice, it was not until the opening of navigation, in the spring of 1829, that access was had to the railroad which had been laid for the experimental trip at Honesdale, Penn., and on August 9, 1829, the first locomotive in America was successfully run with Mr. Allen at the throttle. In September, 1829, he was appointed chief engineer on the South Carolina Railroad, running from Charleston to Augusta, Ga., a distance of 150 miles. A few years later he was appointed principal assistant engineer of the Croton aqueduct, and on its completion became a member of the Board of Water Commissioners. In 1844 he became one of the proprietors of the famous Novelty Iron Works, the firm being Stillman, Allen & Co. Mr. Allen served a single term as president of the Erie Railway, and was for several years its consulting engineer. His last official position was consulting engineer for the Brooklyn Bridge. In 1870 he gave up public life. Mr. Allen was one of the seven gentlemen who organized the Society for Improving the Condition of the Poor, was active in the Children's Aid Society, and was one of the founders of the Union League Club. With all these responsible duties he retained a lively interest in railroad and other engineering matters up to the time of his death.

The engineering profession has lost one of its most prominent members, but the works of Mr. Allen will be a lasting monument.

Literary Notes.

INVOLUNTARY IDLENESS. An Exposition of the Cause of the Discrepancy existing between the Supply of and the Demand for Labor and its Products. By Hugo Bilgram.

The title of this work is well calculated to arrest attention and awaken interest in what the author may have to say on a subject which is of great and growing importance to society as well as to individuals. Wealth is created by the application of labor to the materials of nature, and when the cause or causes which prevent the free application by individuals of their labor to the resources of nature are discovered and removed, the so-called "labor problem" and its attendant difficulties will be solved.

Any sincere attempt to give a solution to these questions is worthy of respectful attention, and especially so when coming from a man who has himself been a working mechanic, and by his own exertions and abilities has come to be an employer of labor as well as a workman. Mr. Bilgram thinks he has discovered the cause of involuntary idleness, in interest on capital, and the monopolization of money. His book is an argument in the interest of all who engage in productive operations as distinguished from the capitalist.

The treatment of the subject, while designedly popular, shows evidence of the mathematical habit of mind of the author. There will, of course, be plenty who will differ from him regarding his conclusions, and, in fact, we do not find ourselves convinced that interest is the only or chief cause of involuntary idleness. Nevertheless we welcome this as a sincere and concientious effort to solve a problem, the solution of which is of vital importance. It is only by free and untrammeled discussion of such questions that truth is eventually arrived at.

The truth or error of a given proposition can best be demonstrated by its being strongly defended and as strongly attacked. It is not within our province to discuss at length the merits of such a question, but that it needs candid discussion there can be no doubt, and we hope that our readers, and mechanics and manufacturers generally, will welcome this contribution of one of their number to the literature of the subject.

The book is published by J. P. Lippincott Company, Philadelphia. Price $1.

QUESTIONS AND ANSWERS

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(9) N. G., Milwaukee, Wis., writes: I am studying Peck's Elementary Mechanics. I have reached De l'Ambert's Principle, but fail to understand the explanation as given by Peck. Please simplify this principle if possible. *A.*—We do not see how we can simplify it. If you have thoroughly mastered that which is given before it, you will not fail to understand this principle.

(10) W. J. D., Lansford, Pa., asks: What is the shortest curve on which a consolidation locomotive will run at a very slow speed?—the rigid wheel base is 14 feet. *A.*—That will depend on the clearance allowed between the flanges of the tires and the rails, also on the width of the blank tires. With a total clearance of about ¾ to ⅞ of an inch, and blank tires about 6½ to 7 inches wide, the engine will run on a curve of 150 feet radius.

(11) Diamonds, Decatur, Ill., asks: Which engine will be most economical, a 12″x24″, or a 12″x36″, both having the same piston speed, and the same amount of clearance? *A.*—There is a difference in opinion; many engineers prefer a long stroke engine if the nature of the work which the engine has to perform will permit a long stroke. If it is simply a question of economy we should prefer the 12″x36″ engine.

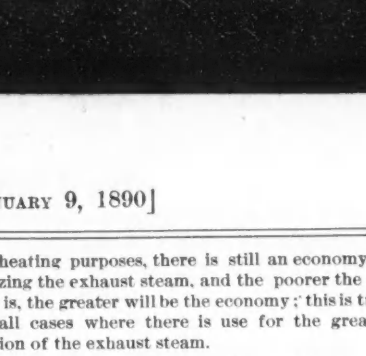
(12) G. B. G., Lexington, Mass., asks: Is there anything gained by using exhaust steam for heating purposes, when it requires a back pressure on the engine to force it through the radiators? Is not the back pressure as much of an expense as live steam from the boiler? *A.*—Although the back pressure may be increased in good working engines say a pound or two, when using the exhaust steam

for heating purposes, there is still an economy in utilizing the exhaust steam, and the poorer the engine is, the greater will be the economy; this is true for all cases where there is use for the greater portion of the exhaust steam.

(13) H. M. S., Boston, writes: Please inform me whether a steam jet in the smoke-stack is injurious to a marine boiler or not. *A.*—No. 2. My idea of a steam jet is that it forms a vacuum in the stack, and the surrounding atmosphere is forced in by its own weight; am I right? *A.*—The steam jet gives an upward current to the air, thereby reducing the density of the gases below that of the air outside, which, on account of its greater weight or pressure, flows into the furnace.

(14) C. N., New York, writes: Please let me know the proper lead for a slide valve engine 15x30 inches; number of revolutions, 86; there is a back-pressure valve in the exhaust pipe to carry 3 pounds per square inch for heating the building. How deep should the anchor bolts go in the foundation? *A.*—We should give it about $\frac{1}{32}$ of an inch lead. The anchor bolts should extend to the bottom of the foundation, and the foundation must be carried deep enough to get a good bearing surface. The length of these bolts for this size of engine should be about 5 feet.

(15) J. B. H., Cleveland, O., writes: I would like to know the rule for finding the length of a safety valve lever. *A.*—See answer to Question 404, in our issue of October 31, 1889. 2. I would also like to know the rules for what is termed "stay-bolt problems"; for instance, if the steam pressure is 150 pounds, what stress will there be on the stay bolt? *A.*—The stress on the stay-bolts will depend on the distances between them. Let s_1, s_2, s_3, etc, represent the stay-bolts, and let it be required to find the stress on the stay bolt s_3. Draw the rectangle $a\ b\ c\ d$ in such a manner as to bring its sides midway between the rivet s_3 and the adjacent rivets s_2, s_4, s_5, s_6. If now the distance between the centers of two adjacent stay-bolts is 4½ inches, the rectangle $a\ b\ c\ d$ will be 4½ inches square, and represents the area which the stay-bolt s_3 has to support. This area is equal to $4.5 \times 4.5 = 20.25$ square inches, and since the steam pressure is 150 pounds per square inch, the total stress on the stay-bolt will be $20.25 \times 150 = 3037.5$ pounds. If now the stay-bolt is ¾ of an inch in diameter at the bottom of the thread, its smallest cross-sectional area will be .44 of a square inch, and has to resist a pressure of 3037.5 pounds, which is equivalent to $\frac{3037.5}{.44} = 6903.4$ pounds per square inch.



(16) A. C. G., Rochester, N. Y., asks: 1. If a tank that is perfectly air tight, having a properly constructed pump attached to it, exhausting the air so that a vacuum gauge placed on the tank indicates 28 inches, what pressure does this 28 inches indicate? *A.*—The gauge indicates in inches of a column of mercury, the difference between the air pressure on the outside of the tank and the air pressure on the inside of the tank. Thus: When the barometer stands at 30 inches, or, in other words, when the air supports a column of mercury 30 inches high, the atmosphere exerts, on the outside of the tank, a pressure of 14.7 pounds per square inch; if now the vacuum gauge shows 28 inches, then the difference between the outer and inner pressure of tank is equal to $30 - 28 = 2$ inches of mercury. To find the corresponding pressure we have only to apply the common rule of three. Thus: If 30 inches of mercury is equal to 14.7 pounds, how much pressure does 2 inches indicate? Here we have

$$30 : 2 :: 14.7 : x = \frac{14.7 \times 2}{30} = 0.98 \text{ pound.}$$

This pressure we can obtain in another way. Thus: If 30 inches indicates 14.7 pounds, how much will 28 inches indicate? Here we have

$$30 : 28 :: 14.7 : x = \frac{14.7 \times 28}{30} = 13.72 \text{ pounds.}$$

But we have seen that the gauge indicates the difference between the inner and outer pressure, hence we have $14.7 - 13.72 = 0.98$ pound, as before. 2. With a vacuum of 28 inches, what will be the pressure on the outside of the tank? *A.*—We have seen that, when the barometer stands at 30, the pressure will be 14.7 pounds; under these conditions the difference between the outer and inner pressure will be 28 inches of mercury, or 13.72 pounds per square inch, which is the pressure tending to collapse the tank. 3. Do different altitudes make any difference, that is to say, can as much vacuum be obtained at 1,000 feet above the sea level as at the level? *A.*—You can reduce the air pressure in the tank as much at a given altitude as at the sea level, and therefore obtain the same degree of vacuum; but, since the atmospheric pressure decreases as the altitude increases, and since the vacuum gauge shows the difference between the inner and outer pressures of the tank, it follows that the vacuum gauge will show a smaller number of inches for the same degree of vacuum. 4. If the atmospheric pressure is 14 pounds per square inch, can more than 28 inches of vacuum be obtained? *A.*—No; you cannot obtain as much. 5. What number of inches denotes a perfect vacuum? *A.*—The number of inches on the barometer. 6. Is there any book published that will post me up thoroughly on this subject? *A.*—Yes; Mechanics of Engineering, by I. P. Church; you may find some parts of this work rather difficult reading, as calculus is used.

(17) R. F. M., St. Paul, Minn., writes: Please give me a formula for determining the safe pressure to which any boiler may be subjected. *A.*—$P = \frac{2t \times s}{d}$. Where P is the safe pressure in pounds per square inch; t, the thickness of plate in inches; d, the diameter of boiler in inches; and s is the safe stress per square inch of metal, and will, of course, depend on the quality of the material used and the manner in which the boiler is riveted. For double-riveted iron boilers, s may be taken at 6,000 pounds, unless special tests of the iron show that a greater value for s may be taken; and for single-riveted iron boilers 5,000 pounds may be adopted. Thus, for instance, a single-riveted iron boiler, 54 inches diameter, plates ⅜ of an inch thick, can be subjected safely to a steam pressure of

$$P = \frac{2 \times \frac{3}{8} \times 5{,}000}{54} = 69.44 \text{ pounds per square inch.}$$

If the rivet holes have been drilled instead of punched, a somewhat greater value for s may be taken, but in the absence of tests of the material and of a knowledge of how the boiler has been put together, the figures here given will be the safest to use. 2. What is understood by a factor of safety in manufacturing of boilers? *A.*—A factor of safety may be defined as the quotient obtained by dividing the breaking strength of any material by its maximum stress to which it is subjected; or, we may say it is the ratio to the ultimate strain which the working load may safely bear. Thus, for instance, if the ultimate tensile strength of iron is 45,000 pounds per square inch, and the maximum stress per square to which the iron is subject is 7,500 per square, then $\frac{45{,}000}{7{,}500} = 6$ = factor of safety. Or, conversely, if a factor of safety of 6 has been chosen, and the ultimate tensile strength of iron is 45,000 pounds, then the load must never exceed $\frac{45{,}000}{6} = 7{,}500$ pounds. 3. How is the throat sheet laid out for a locomotive throat sheet? *A.*—In a manner similar to that of laying out the back head of the locomotive boiler. See our issue of May 9, 1889.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday for the ensuing week's issue.

Gear wheels and g-cutting. Grant, see adv., p 16.

Link-Belting and Sprocket Wheels.
Send for Catalogue of Link-Belting.
Over 50,000,000 feet of Link-Belt in use.
Link-Belt Engineering Co., Philadelphia and N.Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla

Steel Name Stamps, etc., J. B. Roney, Lynn, Mass.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

The Improved Justice Hammer. Williams, White & Co., Moline, Ill., manufacturers.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells, & Co., cor. Fulton and Dutch sts., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

The best Upright Hammers run by belt are made by Jenkins & Lingle, Bellefonte, Pa.

Ice and Refrigerating Machines, 140 sold, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

"How to Keep Boilers Clean." A 96-page book mailed free by Jas. E. Hotchkiss, 120 Liberty st., N.Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Machine Screw Taps of all sizes and threads, manufactured by S. W. Card & Co., Mansfield, Mass.

Iron Planers from 16" to 36" wide by any length. H. C. Pease & Co., Worcester, Mass.

R. G. Du Bois, 715 11th St., Washington, D. C. Procures first class patents on inventions. Write.

Universal and plain Milling Machines. Pedrick & Ayer, Philadelphia, Pa.

Portable Cylinder Boring Machines. Pedrick & Ayer, Philadelphia, Pa.

For the latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson st., Chicago, Ill.

Send $1 for Catalogue D, Fine Tools and Supplies. Over 550 pages. Fully illust'd. Free when $10 worth goods are ordered. Frasse & Co., 92 Park Row, N. Y.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Curtis Pressure Regulators. Curtis Return Trap. Curtis Damper Regulator. See Dec. 12, p. 15. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

25" } Upright Drills a specialty. Finely made,
28" } great capacity, quickly operated, prices low.
32" } Send for list of firms using our Drills. J. E.
36" } Snyder, Worcester, Mass.

The Holly Manufacturing Company, of Lockport, N. Y., will send, on application, their pamphlet illustrating pumping machinery and reports of duty trials.

25" } "Only Drill Press built on
32" } 'Ko-rekt' principles,
37" } even if they come from Jersey."
42" } Gould & Eberhardt, Newark, N. J.

Standard Reducing Valve, Standard Pump Pressure Regulators, Improved Collignon Cylinder Oil Pumps, Jenkins Globe and Angle Valves. Send for circulars. Standard Regulator Co., Buffalo, N. Y.

Steam Boilers: Their management and working on land and sea. By Jas. Peattie. Practical facts from 30 years' experience. 230 pages. Illustrated, 12mo., cloth, $2. Circulars and Catalogue of Books for engineers free. E. & F. N. Spon, 12 Cortlandt st., N.Y.

De Lamater Screw Propeller Wheel made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

H. B Roelker, 22 Cortlandt st., New York, late Sup't De Lamater Iron Works, will hereafter manufacture the De Lamater Screw Propeller.
Propellers of same pattern and workmanship as formerly made by the De Lamater Iron Works. Each designed for its special work at lowest prices.
Consulting Expert and Constructing Engineer.
Estimates made on machinery and on damages.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price $2, postpaid. Published by John Wiley & Sons, 15 Astor Place, New York.

"Binders" for the AMERICAN MACHINIST. Two styles, the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York.

"Practical Drawing." By J. G. A. Meyer. The above series of articles, now running in the AMERICAN MACHINIST, should be closely followed by every student. They commenced with October 23, 1886 issue, and up to and including Dec. 5, 1889 issue, 91 articles have been so far published. Copies containing these articles sent by mail to any part of this country or Canada at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

Just concluded. "Modern Locomotive Construction." By J. G. A. Meyer. The above series of 106 articles, which have attracted so much attention everywhere, is now concluded in newspaper form. Copies of the AMERICAN MACHINIST containing the entire set sent by mail to any address in the U. S., Canada or Mexico for $5.30, or single copies 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

C. H. De Lamater & Co. have closed their extensive manufactory at the foot of West 13th street, New York, and have sold the Hot Air Pumping Engine and Steam Pump business to the De Lamater Iron Works (incorporated in 1889), and the Propeller Wheel business to the Samuel L. Moore & Sons Co., of Elizabethport, New Jersey.

In order to close out the remainder of the stock, offer for sale a very desirable lot of machinery, such as lathes from 15" to 88" swing, planing machines 48"x45"x10', 53"x50"x12', 17" x14"x24', 72"x 69"x24', and various other sizes; drilling machines, slotting machines, shaping machines, boring machines, bolt-cutting machines, cutting-off machines, nut tappers, milling machines, gear cutters, emery tool grinders, portable drills, screw-cutting machines, vises, lathe and planer tools, and a variety of small tools; also traveling and jib cranes.

Punching and shearing machines for boiler makers, with a general outfit of small tools. Blacksmiths' tools, such as anvils, sledges, tongs, etc. Pattern lathes, benches, saws, screws, nails, and a general supply of small tools. Foundry cranes, cupolas and small tools. Blocks, ropes, bolts, nuts, washers, packings, pipe and fittings, iron and brass valves. Boiler iron, steel plate and boiler rivets. Bar iron and steel, also steam hammers and two 8"x16" and one 10"x20" Rider cut-off engines.

MANUFACTURERS

Fifty thousand rubber combs made in Akron, O., annually go to Japan.

The Arkansas Midland Railroad Company will rebuild their machine shops at Helena, Ark.

It is reported that the Barr plant at Mansfield, Ohio, was sold to an Eastern syndicate for $200,000.

A new machine shop and foundry, under the name of the Traverse City Manufacturing Company, will start up in Traverse City, Mich.

The Globe Iron Works, of Cleveland, Ohio, and the Illinois Steel Company, of Chicago, have united in the organization of a company to construct steel ships in Chicago.

The Georgia Stove and Range Company will enlarge the plant which they have purchased of the Atlanta (Ga.) Stove Works, to a capacity of 100 stoves and ranges per day.

W. G. Sutherland, of Edmore, Mich., and George C. Blackman, of Howell, Mich., will establish a foundry and machine shops at Tallapoosa, Ga. The works will be operated under the name of the Tallapoosa Foundry and Machine Works.

There is a movement to concentrate all the morocco manufacturing interests in Philadelphia in a gigantic trust. It is argued that this would greatly reduce the cost of production, and leave more money in the business.

The charter for the Pennsylvania Rolled Steel Car Wheel Company, of Norristown, Pa., has been received from Harrisburg. The capital stock of the company is $1,000,000 divided into 20,000 shares, with a par value of $50. The company will proceed to erect works.

The Ranken & Fritsch Foundry and Machine Company, of St. Louis, are building a Corliss engine, 34x60, for a new plant, which the Waugh Steel Works, at Belleville, are preparing. They are also just turning out a Corliss, 22x48, for the St. Louis Refrigerator and Wooden Gutter Company's local factory.

The Waterloo Land, Mining and Manufacturing Company, Ala., has about concluded arrangements to locate a large wood-working enterprise at Waterloo. It is to run by water-power.

The Central Iron and Steel Company, Brazil, Ind., have recently branched out into the manufacture of railroad spikes, and have erected a separate building for the purpose, which is fitted up with a 10 inch train of rolls, one large gas heating furnace, and four Acheson patent spike machines, with a daily capacity of 300 kegs of 200 pounds each.

The Argentine Republic is reported to be importing about $2,000,000 worth of wire fencing a year now. Half of it comes from Belgium; Great Britain furnishes about a quarter, and France, Germany and the United States the rest. A few years ago the British supplied nearly the entire demand, but the Belgians have run them out of the market by means of a cheaper article.—*Industrial World.*

It is reported that a company with a capital of $2,500,000 has been organized in Alabama, to be known as the Bridgeport Land and Investment Company. It is said that 80,000 acres of coal and mining lands have been secured, that a town at Bridgeport, Ala., is to be established, and negotiations are now pending for the erection of a large cotton mill, furniture and plow factories.

A. H. Andrews & Co. are about to build a large seven-story warehouse contiguous to the firm's factory on Twenty-second street, Chicago, Ill. The firm has also leased the proposed warehouse on Wabash avenue, to be built by the Florsheims. This branching out shows that A. H. Andrews & Co., already consumers of large amounts of hard and soft lumber, will increase their capacity to get away with the mill product.

A. B. Landis, whom our readers will remember as a frequent contributor to the columns of the AMERICAN MACHINIST, together with his brother, has started a shop at Waynesboro, Pa., in which they will manufacture grinding machinery, and other machine tools of a fine class. Mr. A. B. Landis (we do not know the brother) is an excellent mechanic, and has many original ideas, which he will use to further the business ends of the firm.

The Thos. D. West Foundry Co., Cleveland, O., are now building the third large addition to their foundry, and putting in a new 84" cupola and two cranes, to enable them supply their increasing demand for castings. When present improvements are completed, the firm can turn out seventy-five tons of work per day. The iron castings made are for all kinds of purposes, weighing from one pound up to twenty-five tons, and for manufacturers all over the country.

The Chester Foundry and Machine Co., of Chester, Pa., are building for the Phœnix Iron Co., of Phœnixville, Pa., the largest testing machine in the world. It is hydraulic, and will test a piece having a tensile strength up to 2,160,000 pounds. They are also casting the cylinders, condensers, bed-plates and housings, also boring the cylinders, for the U. S. cruisers now in process of construction at Roach's and Cramps' shipyards. They have made contracts for eight new engines during the last few months.

The Schoen Manufacturing Company, of Philadelphia, Pa., engaged in the manufacture of pressed steel articles for railroad equipment, is reported to have decided to move its plant to Pittsburgh, Pa., where iron buildings for it are in course of erection. The new works will be furnished with a complete hydraulic system, and are expected to turn out about fifty tons of manufactured product daily. The capital stock of the company has been increased to $300,000. C. T. Schoen, of Philadelphia, is president, and Henry W. Oliver, of Pittsburgh, vice-president.

The movement in favor of a new steel works at Bristol, R. I., is gathering strength. At the last meeting many subscriptions were obtained, and it looks as though the $25,000 worth of stock required would soon be subscribed. It is proposed to fix the capital at $100,000, one-half to be issued as ordinary and the other to be issued as ten per cent. cumulative shares for $50,000, cash to be used for plant and working capital. The Robert process will be used, and the works, if established, will be erected north of the railroad depot. If the stock is promptly subscribed for, work on the new building will be begun in the spring.

Messrs. Hammond & Son [Pittsburgh, Pa.], who disposed of their property known as the old Pennsylvania Forge to the Baltimore & Ohio Railroad, have not yet decided upon a new location for their plant. Some time ago a large tract of land was offered them at Mansfield, and it was supposed they would erect a mill at that place, but lately there has been a hitch in the proceedings, caused by the owner of the land wanting to put a road through the center of the plot, which the company objected to. It is quite probable that Mansfield will not secure the location of the mill, but that it will be some point on the Pennsylvania Railroad, as several good offers have been made in that direction. The new plant will consist of twenty-four puddling furnaces, including the fourteen they now operate, two pipe mills, and three plate mills. With the fourteen puddling furnaces now operating at the old forge, a very good output is made, equal, as is claimed, to the output of other establishments running twenty or twenty-two furnaces. The daily make for double-turn is about twenty-three tons, and if it were not for the Christmas stop, the production for the month would be over 1,000 tons. —*American Manufacturer.*

Machinists' Supplies and Iron.

NEW YORK, Jan. 4, 1890.

Iron—American Pig.—A firm feeling prevails, and supplies for prompt as well as forward delivery are held at full prices, but fresh business for current delivery transacted, has, within the past few days, been of moderate proportions. For such quantities as are being placed, buyers are paying $19.50 to $20.50 for No. 1 X Foundry, according to brand; standard Lehigh brands sell readily at $20. The impression prevails that the books of the Thomas Company will be opened for 1890 deliveries at the last-named price.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Wanted—A competent bobbin and shuttle tool maker. Durham Bobbin & Shuttle Co., Durham, N C.

Wanted—Good machinists, and one or two pattern makers. The Pond Mach. Tool Co., Plainfield, N. J.

Foreman and contractor wanted, who can handle men and do good work promptly. Address Steam Engine, care AMERICAN MACHINIST.

Wanted—Foreman boiler works who can manage about 25 men and get out good work at lowest cost. Address A. J. P., AMERICAN MACHINIST.

A competent mechanical draftsman and machine designer will be open for engagement in a few weeks. Address BOX 70, AMERICAN MACHINIST.

A young man, graduate from a technical school in Europe, and some experience in a drafting-room in this country, wants position. Box 71, AM. MACHINIST.

Wanted—An experienced man to take charge of a milled machine screw works. Address Screw Factory, care AMERICAN MACHINIST.

Wanted—A mechanical draftsman. $14 per week Good opening for a young man. Also a tool maker and machinist who has had experience in handling help. Address C. & M., 234 W. 29th st., New York.

Machinists Wanted—First-class vise and machine hands of good habits, can find steady employment and liberal wages Address Morgan Engineering Company, Alliance, Ohio.

Wanted—Capitalists, or a syndicate, to take hold of and operate in the foreign countries a valuable invention for finishing iron and steel. Address "Machine," AMERICAN MACHINIST.

Wanted—A 1st-class draftsman who has had exp. in designing machine tools and special machinery, tools, fixtures, etc. Must be up to the times and know something about shop system. State age, exp., and pay expected. Address BOX 67, AM. MACHINIST.

Mechanical engineer and draftsman, graduate of a German technical college, and familiar with the most modern machine shop practice, desires engagement as draftsman or ass't sup't. Address M. Spitzer, 132 E. 1st st., Dayton, O.

Wanted—Foreman for machine shop employing 15 to 20 hands on nice work, in a town 20 miles west of Philadelphia. Permanent position to careful, systematic, energetic man. Address "S.," care AMERICAN MACHINIST.

Wanted—A machine shop foreman. Eastern location. Heavy work. Please address Richard Roe, care AMERICAN MACHINIST, New York, with statement of exp., age, nationality, compensation desired, etc. Correspondence will be treated as confidential.

Wanted—A thoroughly competent time-keeper for an iron works employing five hundred men. One who understands keeping both day and piece-work time. State age, experience and salary. Address BOX 69, AMERICAN MACHINIST.

Foreman Pattern Maker—Situation wanted. Have had experience in fine sewing machine, light machinery, and electrical pattern making in wood and metal. Have acted in capacity of foreman for a number of years. Can come well recommended. Address Pattern Maker, P. O. Box 672, N. Y. City.

Wanted—Foreman for a modern machine shop near Boston, Mass., running twenty-five men on medium weight machinery. Must be an energetic man that can turn out good work, and lots of it. State salary wanted and experience. Address M. M., care AMERICAN MACHINIST.

Wanted—Mechanical engineer, experienced in designing and building modern automatic high-speed engines (plain and compound). One who is capable of taking charge of correspondence, and acting as general manager of office and shops Location, Southern Pennsylvania. Box 64, AM. MACHINIST.

Wanted—Superintendent for pipe mill. The applicant must be thoroughly acquainted with all the details of the pipe business, must be able to construct and run either Bell, Butt or Lap-Weld Furnaces. Must understand the use of natural gas as fuel, and all that pertains to Siemens Furnaces. Apply to Oil City Tube Co., Oil City, Pa.

Wanted—Engineer to take charge of the engines and machinery in an electric light station in the West, running about 1,200 H. P. Corliss and high-speed compound condensing engines. State experience, age, and give references. A first-class man can secure steady employment and good salary. Address D. W., care AMERICAN MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

¾" Portable Drill, $100. Am. Tool W'ks., Clev. O.

Koopman's Scales for quick measurements.

Glass Triangles. F. E. Harthan, Worcester, Mass.

Just out; aluminum-steel hack-saws, hard but not brittle. Crescent Mfg. Co., Cleveland, Ohio.

New catalogue of engineers' specialties free. Crescent Mfg. Co., Cleveland, O.

Light and fine machinery to order; Foot Lathe. Catalogue for stamp E. O. Chase, Newark, N. J.

August C. Christensen, 24 State st., N. Y., Consulting Engineer. Designs of all kinds of Machinery.

Turned and Highly Polished Iron and Steel Shafting a specialty. Merwin McKaig, Cumberland, Md.

Complete list of our Scales and other new tools for 2c. stamp. A. T. Koopman, Chicago.

Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., P. O. Box 1262, Phila., Pa.

For Sale—An established mach. business, protected by valuable patents. Can be much enlarged by judicious management. C. M. W., AM. MACHINIST.

Wanted—To buy second-hand lathes, planers and shapers of all sizes; must be cheap and in good order. Fosdick & Plucker, 6th and Culvert Streets, Cincinnati, O.

How to remove and prevent scale in steam boilers at a cost of ten cents a week. Send postal for circular to Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa.

Amateur Lathe; Costly appliances; novel attachments for plain and complex turning; 3 slide rests; 5 cutting frames; 100 chucks; 1,000 tools; gear cutter; 3 ways of cutting screws and spirals. Circular from F. N. Massa, 1418 B'way, New York.

For Sale—Tools, patterns and fixtures for the jobbing machine business. Good will and list of customers will be sold at a great bargain at Sioux City, Iowa, the most enterprising, progressive and rapidly growing city in the Northwest, by the Sioux City Engine Works. For full information, call on or address Sioux City Engine Works, Sioux City, Iowa.

Established 1832. BRADLEY'S POWER HAMMERS
"The BEST in the WORLD"
RUN BY BELT.
Over 1500 in USE
BRADLEY'S SWEDGE HAMMER. BRADLEY'S UPRIGHT HAMMER. BRADLEY'S UPRIGHT HAMMER.
BRADLEY'S HEATING FORGES
Indispensable in all shops to keep BRADLEY'S CUSHIONED HAMMERS and men fully employed and reduce the cost of production.
BRADLEY'S HARD COAL HEATING FORGE. BRADLEY'S SOFT COAL FORGE.
BRADLEY & CO. SYRACUSE, N.Y.
42 Murray st. NEW YORK. 98 Sudbury st. BOSTON, MASS.

STEAM ENGINES
Upright and Horizontal, Stationary, Portable and Semi-Portable.
8 to 16 Horse Power.
Illustrated Pamphlet Free. Address
JAMES LEFFEL & CO.
SPRINGFIELD, OHIO, or 110 Liberty St., New York.

PATENTS.
The greater part of my fees may be paid on allowance of U. S. applications undertaken before March 1st, 1890. A somewhat similar arrangement may be made with regard to Foreign Patents, for which I have lately improved my facilities. WM. H. BABCOCK, Attorney-at-Law and Solicitor of Patents, 513 Seventh St., Washington, D. C., P. O. Box 220. *Formerly Assistant Examiner in U. S. Patent Office. Thirteen years' practice.*

VOLNEY W. MASON & CO.,
Friction Pulleys, Clutches and Elevators,
PROVIDENCE, R. I.

JOHN WILEY & SONS, NEW YORK, PUBLISH

WILSON'S STEAM BOILERS,	12mo, cloth,	2.50
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$75 "Star" Foot Lathe Swings 9x25 in. LATHE Screw Cutting Automatic Cross Feed, etc.
Scroll Saws, Circular Saws, Lathes Mortisers. Catalogue Free of all our Machinery.
Seneca Falls Mfg. Co., 687 Water St., Seneca Falls, N. Y.

Maslin's Patent Pulsator Pump.
PAT. FEB. 12, 1889.
Cheapest and Best Automatic Steam Vacuum Pump. Handling DIRTY and GRITTY LIQUIDS without Wear, Oil or Care. Simple, Economical, Efficient & Durable. Pumping Plants for Contractors, Irrigation, Water Works, Railroads, Mining & General Hydraulic Purposes. Write or call for Circulars. JOHN MASLIN & SON, SOLE MANUF'RS, 165-167 1st St., Jersey City, N. J.

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New York, Boston, Chicago, Philadelphia, St. Louis,
Manufacturers of
STEAM and POWER
PUMPS
FOR ALL PURPOSES.
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Drill Rods. Sheet Steel. Fine Wire. Machinery and Spring Steel. Forgings. Coiled Springs. Die Blocks. Steel for Hardware of all kinds.
CRESCENT STEEL CO.,
CHICAGO, ILLS. PITTSBURGH, PA. NEW YORK, N. Y.

$175. Improved Screw Cutting Foot and Power LATHES $60
Drill Presses, Shapers, Band, Circular and Scroll Saws. Machinists' Tools and Supplies. Lathes on trial. Catalogue mailed on application.
THE SEBASTIAN-MAY CO., 167 W. 2d St.,
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TOBIN BRONZE
Tensile Strength upwards of 79,000 lbs. per sq. in.
Torsional Strength equal to the best Machinery Steel.
Anti-Frictional and Non-Corrosive.
CAN BE FORGED HOT.
Rods for pumps and bolts. Yacht shafting. Rolled sheets and plates for pump linings and condenser tube sheets, &c. Ingot metal for car and engine bearings. Spring wire.
ANSONIA BRASS & COPPER CO.,
Sole Manufacturers.
Send for Circular. CHICAGO. NEW YORK.

THE Vance Lightning Flue Cutter
For removing Flues from Locomotive and Stationary Boilers. One man can cut five hundred (one end) in a day. In use in the leading Railroad Shops of the country. Combination Cutter for removing 2 in., 2 1-4 in., 2 1-2 in. and 3 in. Flues, $50. Sent on approval to Railroad Co.'s. Liberal Discounts to the Trade.
VANCE TUBE CUTTER CO., Geneva, N. Y.

PATTERN MAKERS' SHOOT PLANE & JACK BOARD.
A. J. WILKINSON & CO.,
Box 3600.
BOSTON, MASS.
SEND FOR CIRCULAR.

BOYNTON'S ADJUSTABLE ALLIGATOR WRENCH.
Quick and handy in adjustment. Invaluable for work on clipped pipe, in close coils and corners that cannot be reached with other wrenches. Made entirely of drop forged steel. Six sizes.
Campbell Printing Press and Mfg. Co., Mfrs.
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WIRE STRAIGHTNER PAT. FEB. 1886
Can be used in any Hollow Spindle Lathe.
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GLEASON MACHINE TOOLS.
Lathes 22 inch to 72 inch swing.
Planers 26 inch to 84 inch wide.
Special Characteristics: Great weight, Great Power and Excellent Workmanship.
HILL, CLARKE & CO.,
156 OLIVER ST., BOSTON.

Dodge Independence Wood Split Pulleys.
Lighter than Iron.
Greater traction than Iron.
Bushing system allows each pulley to be fitted to 22 sizes of shafts.
COOKE & CO., Sales Agents,
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Shafting, Hangers, Engines, Boilers, Etc.
Write for prices, mentioning this paper.

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MAKERS OF
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FOR
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Iron and Steel Works Generally.

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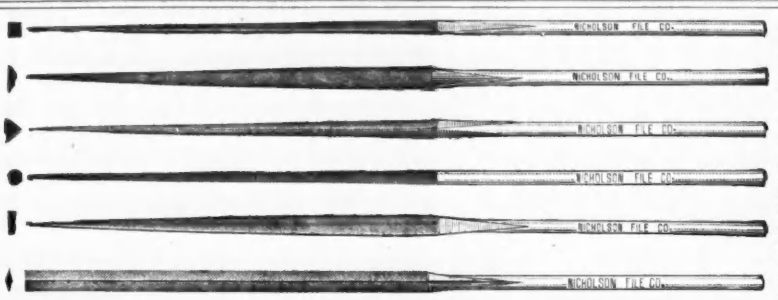

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NEW STYLES, SKELETON FRAME, ADJUSTABLE SCREW AND SLIDING TOP. (See cut.)

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IMPROVED HANDY, VOLUNTEER AND NATHAN SIGHT FEED LUBRICATORS.

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CRUCIBLE AND OPEN HEARTH
CAMERON SELF-HARDENING
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ESTABLISHED 1859.
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BRANCH OFFICES: 12 Cliff St., New York. 127 Oliver St., Boston. 228 Lake St., Chicago.

Hall Steam Pump

WHAT USERS THINK OF THE **Duplex Pump.**

We take pleasure in expressing to you the great satisfaction we have experienced in the use of your pumps. We have quite a number of steam pumps in our establishment, of various standard makes, but we consider the two supplied us by you as eminently superior to the others, on account of their simplicity and strength of construction, which prevents their getting out of order. We give them no more attention than a line of shafting would get, and find them always ready for the heaviest work. When we require more pumps you can be sure that they will be of your make.

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FITCHBURG MACHINE WORKS,
Manufacturers of
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NOS. 13 to 21 MAIN STREET,
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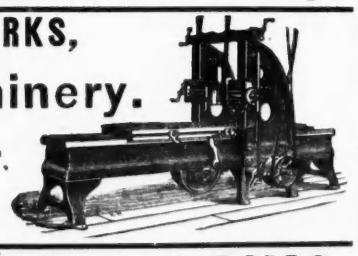

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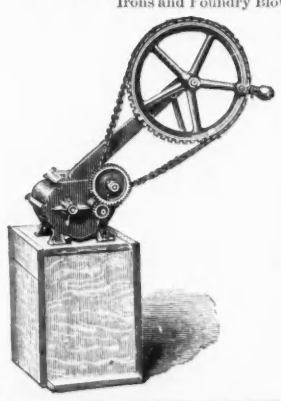
For Blacksmiths, etc. Slow Speed, Positive Blast. Is durable, Compact and Cheap; also Portable Forges, Tuyere Irons and Foundry Blowers.



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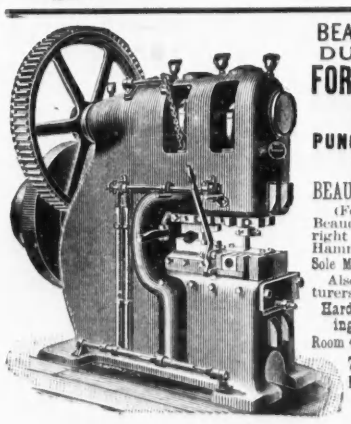

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SMOOTH INSIDE & OUT.
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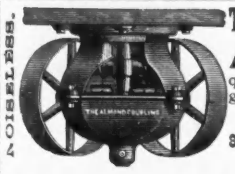

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A NEW quarter turn motion to replace quarter turn belts and bevel gears.
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ALL KINDS OF **Steel in Stock.**
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With Steel Screw. Lathe Made and Hardened.

REDUCED PRICE OF LE COUNT'S HEAVY STEEL DOG

No.	Inch.	Price.
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3	5-8	.60
4	3-4	.60
5	7-8	.70
6	1	.70
7	1 1-8	.80
8	1 1-4	.80
9	1 3-8	.95
10	1 1-2	.95
11	1 3-4	1.10
12	2	1.20
13	2 1-4	1.35
14	2 1-2	1.45
15	3	1.60
16	3 1-2	1.80
17	4	2.10
18	4 1-2	2.75
19	5	3.25
Full set of 19		$23.60
20 (ext.)	5 1-2	4.00
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This Dog has a Very Heavy Jaw, so that if the thread wears a Heavier Screw can be substituted.

When ordering, state as above, whether a full set or a set of 12, or small set of 8. Users of these dogs prefer them to any other make.

One Small Set of 8—by 1-4 inches to 2 inch, - - $ 6.25
One Set of 12—by 1-4 in. to 2 in. continued by 1-2 in. to 4 in. 13.25
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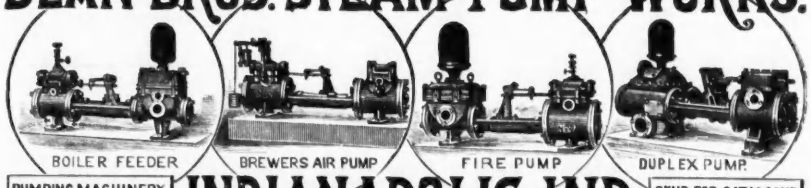

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THE BUFFALO STEAM PUMP CO
MANUFACTURERS OF STEAM PUMPS.
FOR ALL DUTIES.
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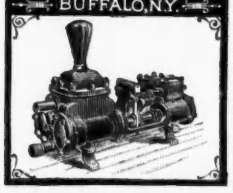

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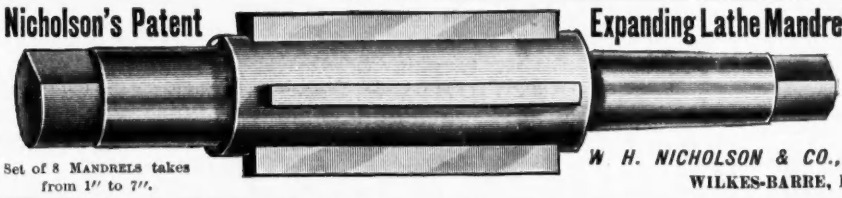
Nicholson's Patent Expanding Lathe Mandrels.



Set of 8 MANDRELS takes from 1" to 7".
W. H. NICHOLSON & CO.,
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FOR IMMEDIATE DELIVERY.
16-20, 20 & 24 Inch ENGINE LATHES,
14 & 16 inch BRASS LATHES,
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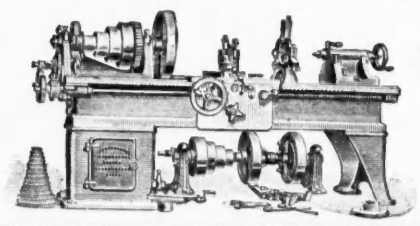

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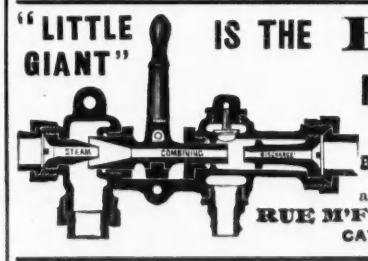

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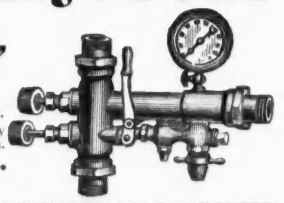

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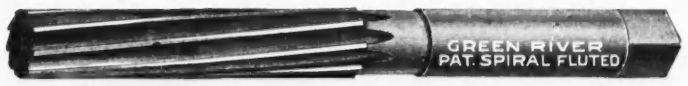

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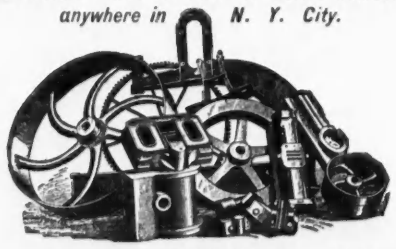

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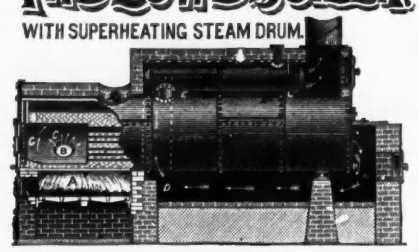

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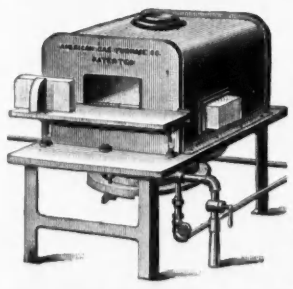

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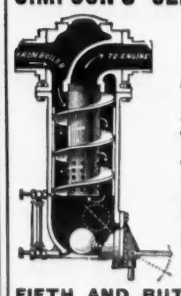

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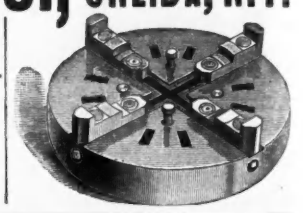

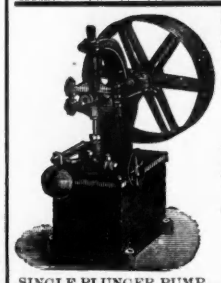

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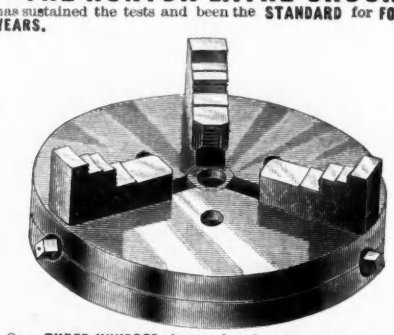

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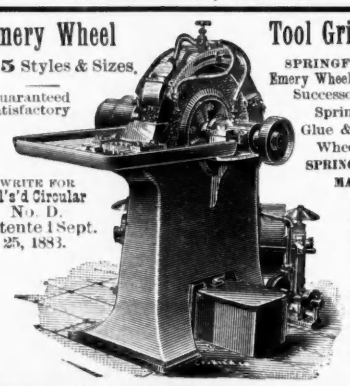

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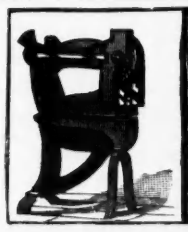

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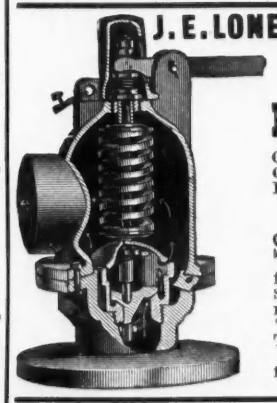

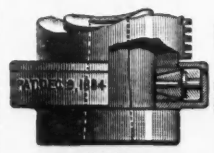

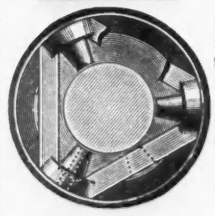

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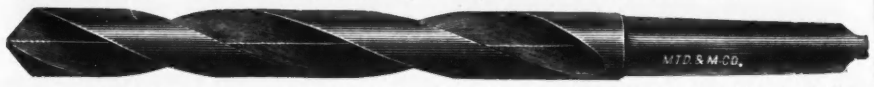

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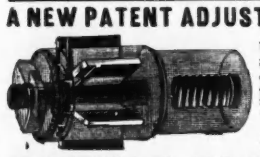

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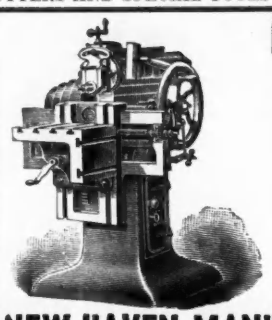

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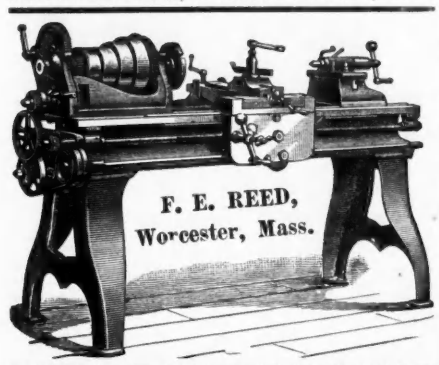

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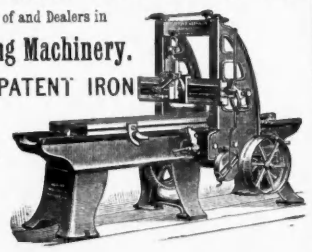

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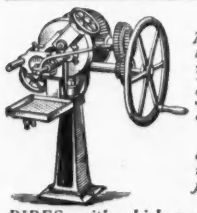

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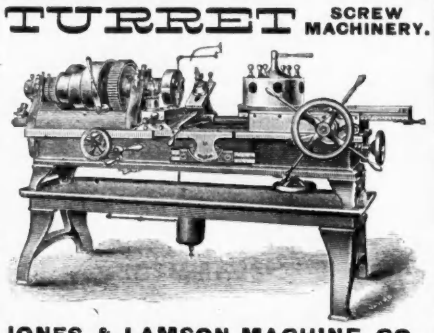

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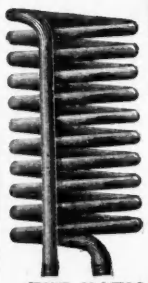

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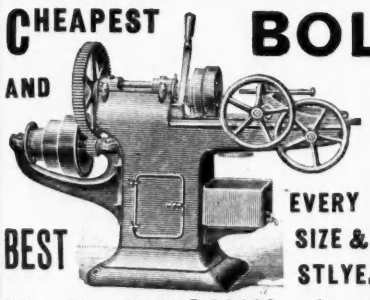

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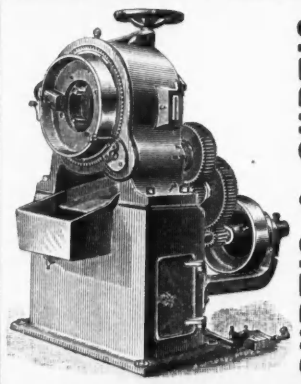

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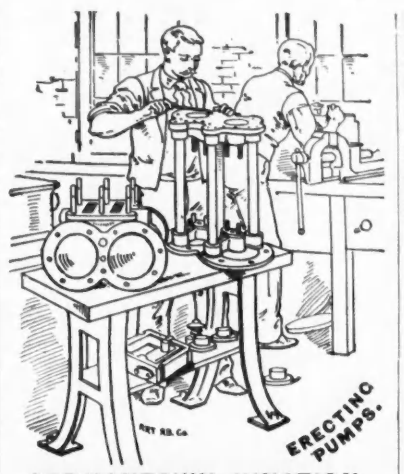

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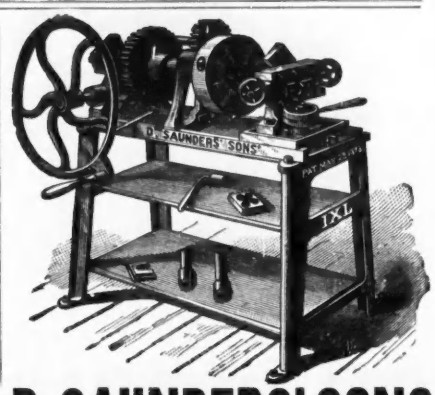

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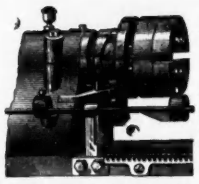

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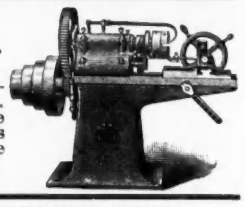

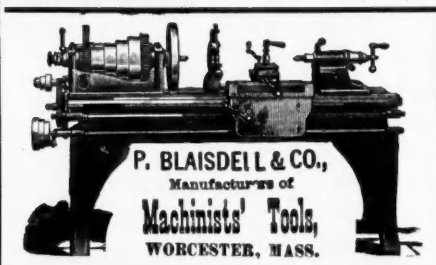

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1 20 in. x 8 ft.	" "	Wright,	new.
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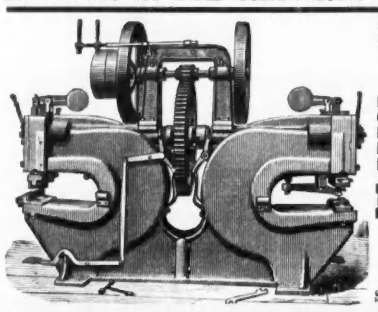

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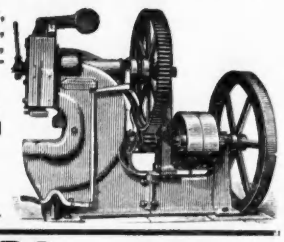

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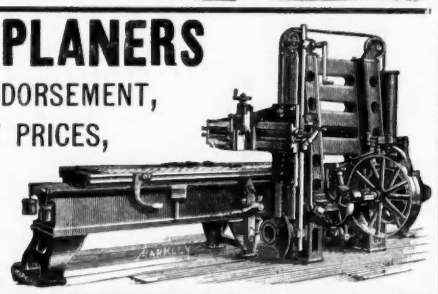

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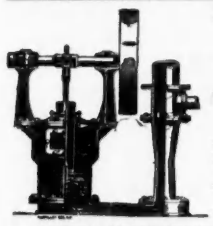

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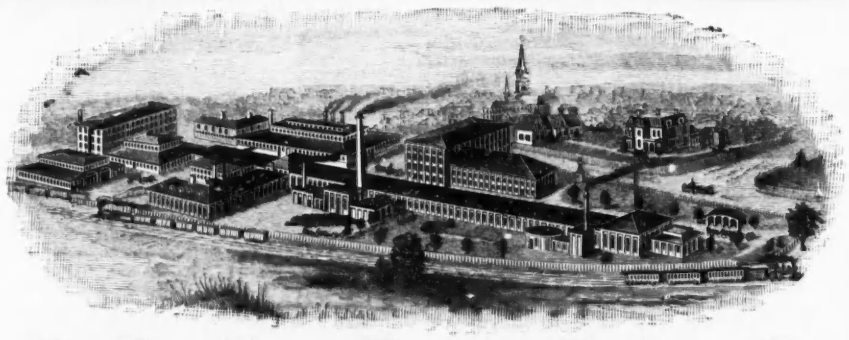

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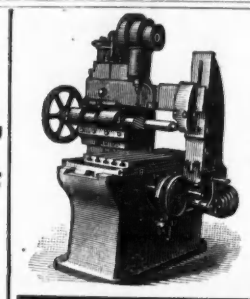

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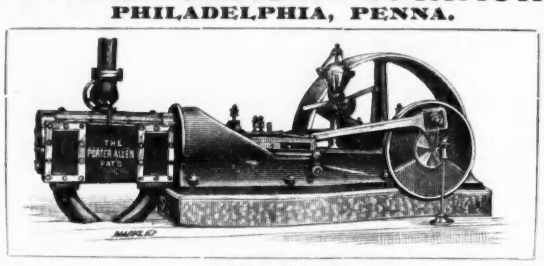

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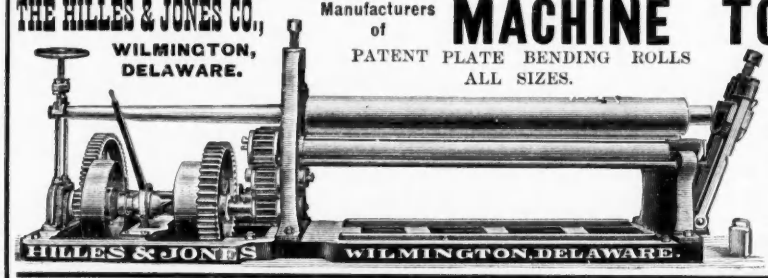

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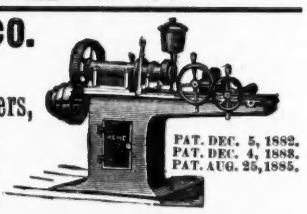

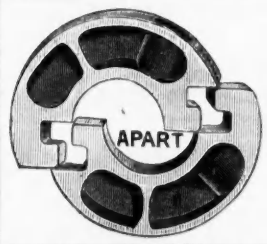

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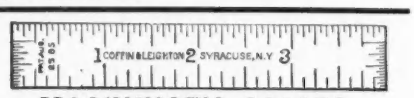

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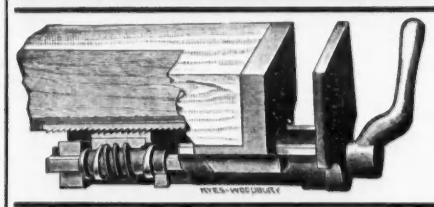

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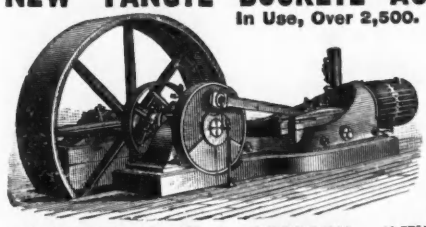

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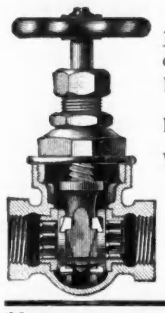

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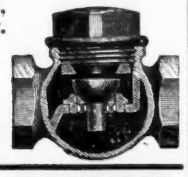

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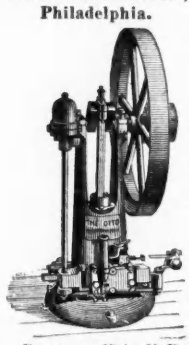

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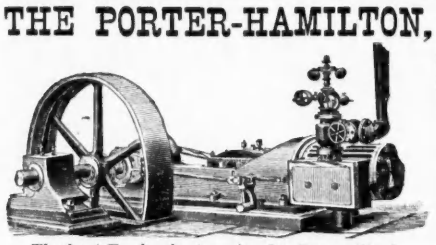

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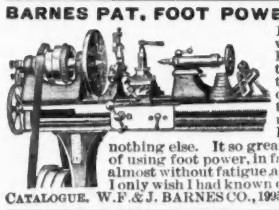

I feel so highly pleased with your Velocipede Foot Power with seat, that I wish to add my testimony to its superiority. I did not expect to like it, but having used the Velocipede Power I would have nothing else. It so greatly lessens the fatigue of using foot power, in fact, it may be said to be almost without fatigue and is a steadier motion. I only wish I had known of it sooner. SEND FOR CATALOGUE. W. F. & J. BARNES CO., 1995 Ruby St., Rockford, Ill

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9 and 12 in. Shaper,		H. & P.	good.
12 in Crank Shaper,		Jengst,	new.
12 in " "			cheap.
6-8-10-12-15 in Crank Shapers			
15in. Hendey Shaper,			good.
15x20 in. Friction Shapers,			
20-24-26 and 32 in. Geared Shapers.			
11 in. x5 ft. Engine Lathe,			
14 in. x6 ft. "		Blaisdell & Prentice Bros.	new.
14 in. x7 ft. "		Bogert,	"
16 in. x8 ft. Engine Lathe, with Turret Head,		Perkins,	A 1.
15 in. x6 and 8 ft. "		Porter,	new.
16 in. x6 and 8 ft. "		McMahon,	"
16 in. x6 and 8 ft. "		Prentice Bro.	
18 in. x8 ft. "		Blaisdell,	new.
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18 in. x8-10-12 ft. "		Different Makes,	"
20 in. x8-10-14ft. "		Different Makes,	"
20 in. any length Bed "		Bridgeport,	"
20 in. x12 ft. "		Wheeler,	fair.
24 in. x8-10-12 "		Bridgeport,	new.
24 in. x12 ft. "		Blaisdell,	"
24 in. x16 ft. "		New Haven,	cheap.
26 in. x11 ft. "			"
28 in. x14-16 & 18ft. Engine Lathes,		F. & S.	new.
32 in. x16 ft. Engine Lathe,		Fay & Scott,	"
26 & 50 inch Pulley Machine,		Stevens,	good.
Bement Car Axle Lathe,			"
20 in. Drill Lever,		Reed,	"
20 in. Drill		Davis,	new.
20-23 25 28 inch Drills		Blaisdell,	"
20 25 28 32 inch "		C. & S.	"
Cabinet Turret Lathe, Lodge, Davis & Co.			new.
No. 3 Screw Machine, Brown & Sharpe.			cheap.
Ames Index Milling Machine,			fair.
No. 1 and 3 Universal Miller, Brown & Sharpe,			new.
No. 1 Pulley Set Screw Machine, Newton			
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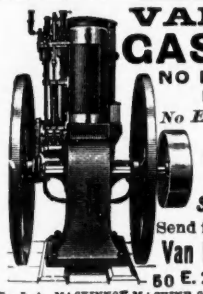

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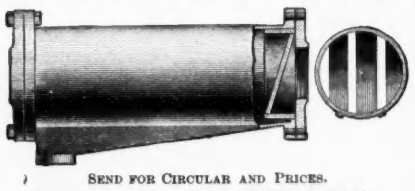

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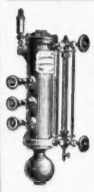

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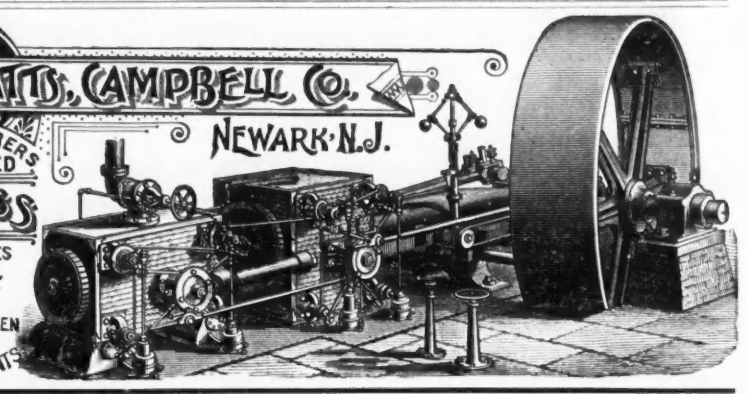

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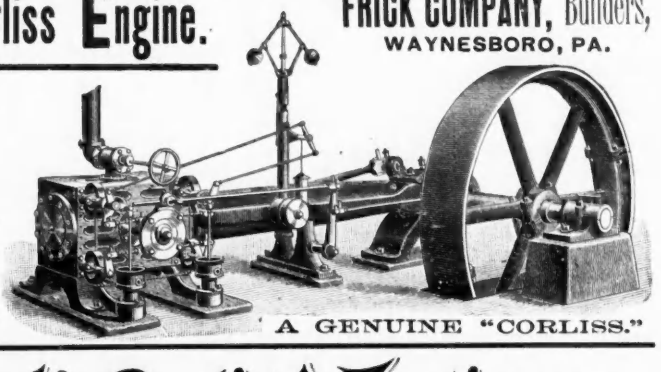

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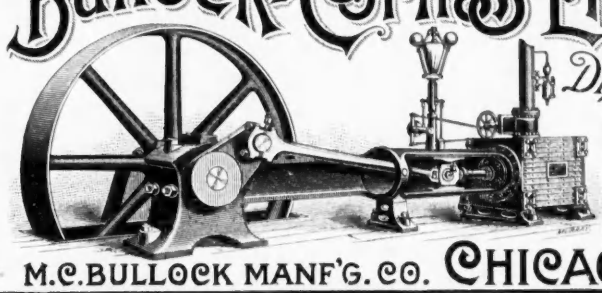

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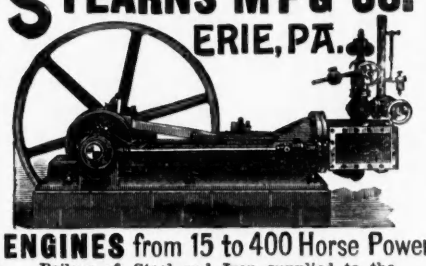

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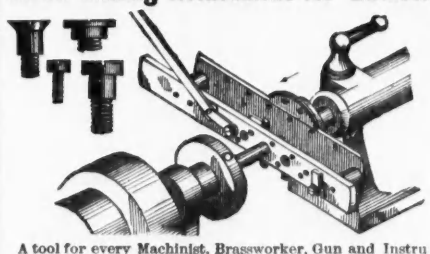

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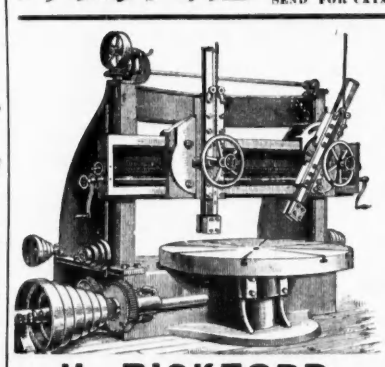

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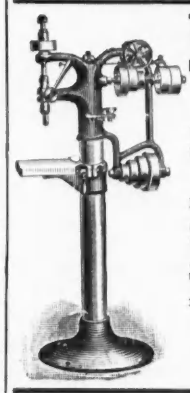

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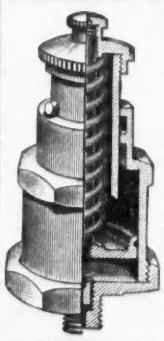

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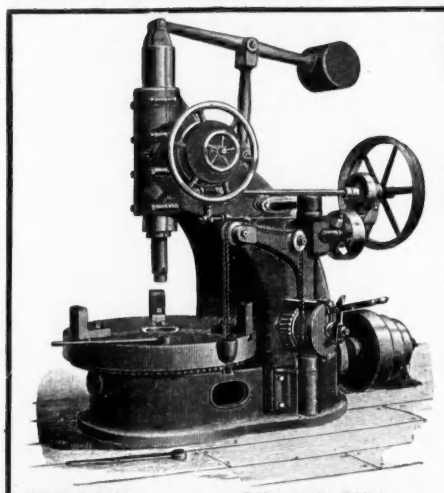

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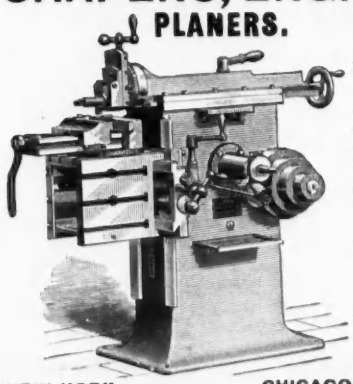

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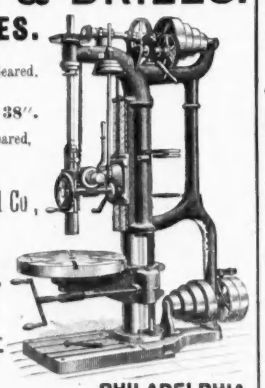

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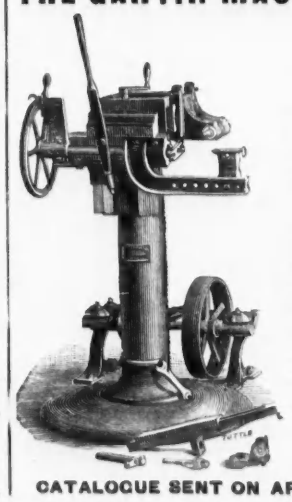

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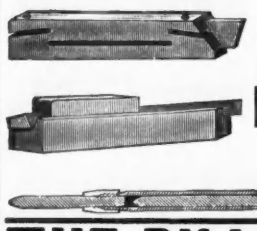

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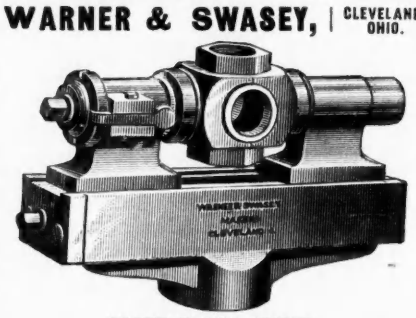

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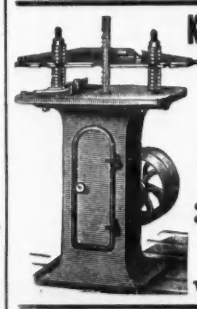

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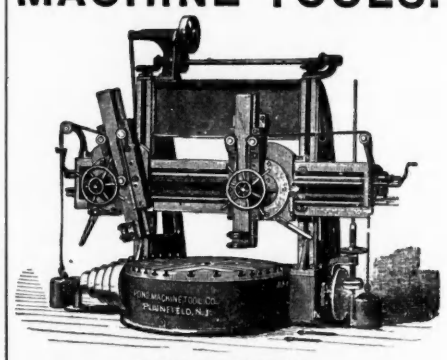

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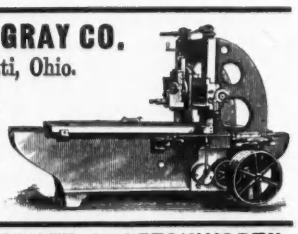

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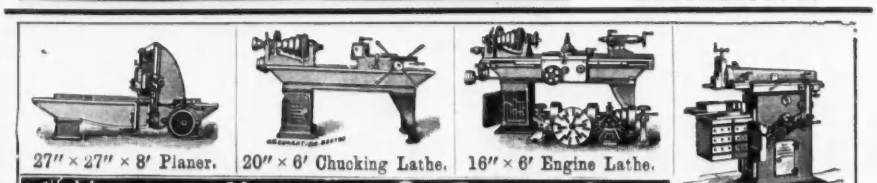

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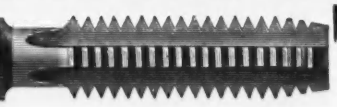

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